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STRATEGY OUTLINE FOR ACCELERATED AGRICULTURAL DEVELOPMENT OF AMERICAN-AFFILIATED PACIFIC ISLANDS

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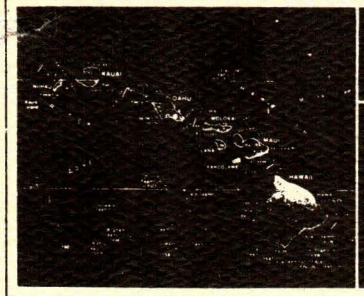

Hawaii Institute of Tropical Agriculture and Human Resources

UNIVERSITY OF HAWAII

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I. INTRODUCTION

A. Content and Purpose

This report begins with the rather bold premise that accelerated agricultural development may be the best means of ensuring self-sustaining growth for geographically isolated and economically underdeveloped areas where agricultural activity has declined to an almost non-existent level. It is concerned with development prospects for the American-affiliated islands of the Pacific--Guam, American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), the Marshall Islands, the Republic of Belau, and the Federated States of Micronesia (FSM) (the last four groups comprising what has been known as the Trust Territory of the Pacific Islands (TTPI)).*

While there is ample historical precedent and documentation from other areas for this premise, it was adopted only after visits to several of these islands and in-depth discussions with development officials, technicians, and researchers brought out the more fundamental view that: Most islanders want neither a return to a primitive lifestyle nor an advance into a high-technology society that is beyond their means to sustain, but rather they want to go forward in ways that improve their well-being without destroying their self-reliance and their culture. Further, the initiative for development must come from the people and governments of the respective islands, rather than from the outside.

This paper does not purport to break new ground in the field of development economics. Rather, it represents a synthesis of the "conventional wisdom" for accelerated agricultural development as reflected in the literature, island

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*While the State of Hawaii may be regarded as part of the American-affiliated Pacific islands, it will generally be dealt with as a separate entity in this report. Although Hawaii's family farm sector has experienced and shares many of the problems of the other island areas, the State's role as seen here will be that of a conduit for technical and research assistance. Except as indicated in the subsequent text, the terms "American-affiliated Pacific islands" or an abbreviated "Pacific islands" will refer generally to the territories mentioned above. Also, the terms "Trust Territory" and "Micronesia" will be used interchangeably.

agricultural planning reports and studies, and on-the-spot judgments offered during field interviews by individuals who have been concerned with, or have responsibility for, such development in these islands.

Thus, the main value or utility of this report may be that the material has been screened for relevance and adapted to American-affiliated Pacific islands. Finally, the material was interpreted to develop, where possible and appropriate, recommendations for accelerating agricultural development in the American-affiliated islands of the Pacific.

The material was assembled in this fashion because there is a lack of relevant literature on comprehensive agricultural development strategies written specifically for small, tropical island economies; the available literature is either incomplete or is written for large, heavily populated countries which differ markedly from the subject islands.

In presenting the information, it is recognized that the islands being discussed differ greatly from each other in terms of history, culture, resources, economic development potentials and achievements, and more. Nevertheless, there are a great many similarities in terms of agricultural development problems. These differences and similarities are discussed more fully in the report submitted to the U. S. Department of Agriculture under the title, Socio-Economic Criteria for Scientific Research to Improve Tropical Food Production Systems (with Particular Reference to the American-Affiliated Pacific Islands).

The present report focuses on: (1) the typical problems or constraints which restrict agricultural development for many of the American-affiliated islands of the Pacific, (2) the key factors commonly judged to be necessary for developing an economically healthy agricultural industry, (3) agricultural development approaches which should be favored because of past successes, and those which are appealing but experience shows should be avoided because of past failures, and (4) typical impacts which accompany successful agricultural development.

This document constitutes as it were a strategy outline to assist in solving agricultural development problems typical of these islands, including guidelines on appropriate research. Additionally, the material should be (and in fact already has been) of use in developing agriculturally-oriented socio-

economic profiles of island economies, and should provide a standard of comparison to help identify factors restraining agricultural development. Also, the outline should provide guidance in overcoming those factors which restrain growth, and in anticipating significant impacts which normally accompany agricultural-based development.

The material is presented with little or no elaborate discussion; nor are alternative approaches explored nor past experiences reviewed in detail. The material here is designed to meet the needs of time-constrained government policy makers or research administrators who require an acquaintance with important developmental concepts without having to go through a number of lengthy documents. Where a fuller discussion is needed to clarify particular concepts or approaches, reference can be made to the relevant literature. Books and reports particularly rich in content are indicated in the Bibliography with an asterisk (*).[1/]

The underscoring in this publication indicates key concepts or principles which are judged to be of importance to government planners. The CAPITAL LETTERING designates material of particular relevance to research administrators and possible funding or technical assistance agencies.

B. The Role of Hawaii in the Agricultural Development of the American-Affiliated Islands of the Pacific

1. Hawaii's Role in Pacific Development

Over the years, Hawaii has become increasingly involved in the development of the American-affiliated and other islands of the Pacific. Many of the arrangements have occurred on an individual basis, with Hawaii residents often assuming responsible positions in government or private industry in the various islands. Also, many Pacific islanders, including legislative and administrative leaders, have been educated at the University of Hawaii or other schools in Hawaii. There have been formal arrangements as well. For example, Hawaii is a member--along with Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa--of the Pacific Basin Development Council, and serves as its headquarters. Similarly, the Western Pacific Regional Fishery Management Council is located in Hawaii, as is the East-West Center, and its growing Pacific islands program.

1/ Special recognition in this regard must be given to the comprehensive volume, To Feed This World: the Challenge and the Strategy, by the late Sterling Wortman and Ralph W. Cummings, Jr. of the Rockefeller Foundation.

Also, the University of Hawaii's College of Tropical Agriculture & Human Resources (CTAHR), under a U.S. State Department contract, is assisting the University of the South Pacific in the development of its agriculture program. Further, many Federal agencies having jurisdiction in American-affiliated islands, such as the U.S. Soil Conservation Service, have their regional headquarters in Hawaii.

Hawaii's increased involvement in the development of other Pacific islands results from a number of factors. There is the natural affinity and sympathy with other islanders, particularly since Hawaii experienced decades earlier many similar problems. Some of these problems have been solved; others remain--such as those associated with market and infrastructure development, and the need to develop a more diversified economy. Also, some of the solutions have resulted in unexpected and sometimes undesirable impacts. Because of this experience, Hawaii can furnish lessons for both successful and unsuccessful development approaches.

Hawaii is also a centrally located source of considerable expertise, particularly in the fields of agriculture, aquaculture, fishing, and alternative energy. Hawaii not only has the CTAHR and other sources of knowledge within the University of Hawaii, but it also is the home of the East-West Center, the Hawaii Sugar Planters' Association, and a number of well-known international consulting firms that specialize in agriculture and other development activities.

2. Food for Peace Act

One of the more recent events which calls for Hawaii to become even more actively involved with the development of Pacific islands and countries is the U.S. Department of Agriculture's designation of the CTAHR as the Pacific Basin Center for Tropical and Subtropical Research. This research program is funded under Section 406 (the Matsunaga Amendment) of the 1966 Food for Peace Act, the objective of which is to assist friendly developing countries to become self-sufficient in food production.

This report is from one of the projects of the Section 406 research program. It is intended to contribute to the agricultural development of the American-affiliated Pacific islands, and identify particular research needs which can be addressed by the CTAHR and other relevant agencies.

C. Economic Development Considerations for Less-Developed Countries

Before discussing the specific reasons for focusing on agriculture as a

development strategy for the American-affiliated islands of the Pacific, it is worthwhile to summarize briefly several important lessons in development policy from the economic performance of developing countries during the postwar period. This is particularly relevant to many of the American-affiliated islands of the Pacific which have followed economic development strategies largely inconsistent with these lessons. The basic lesson is that agricultural development must be part of a larger development strategy with other components which must receive attention. The key developmental experiences have been:

(1) Emphasis on agriculture.

High rates of economic growth are associated with rapid expansion of agricultural output, while low rates of economic growth are associated with slow growth of agriculture. What is interesting is that the expansion of agricultural output has by no means been confined to those countries which have an abundant supply of unused land to be brought under cultivation.

As the literature suggests, agricultural expansion has provided the major source of funding for the capital formation and infrastructure requirements of the underdeveloped country, particularly social-overhead projects, such as roads and water systems. Furthermore, agricultural development increases the incomes of the many people in the countryside and thereby serves two important functions. First, it increases the size of the domestic market for the manufacturing sector, thus contributing significantly to balanced growth. Second, it reduces internal economic disparities between the urban centers and the rural districts.

(2) Emphasis on exports.

The high growth countries have been characterized by rapid expansion in exports. It is important to note that export expansion has not been confined to those countries which are fortunate in their natural resources. Some of the less-developed countries have been able to expand their exports in spite of limitations in natural resources by initiating economic policies that shift resources from inefficient domestic activities to export production. Nor has export expansion from these countries been confined to primary products. Exports of labor-intensive, semi-processed and manufactured goods have expanded considerably.

It should be noted also that many countries in the earlier stages of their development followed import substitution policies in an attempt to develop a modern industrial base and lessen their reliance on overseas goods. However,

shortages of foreign exchange, skilled manpower, capital equipment, and required technology have caused a shift in recent years to export promotion policies. The importance of concentrating on exports derives from the ability of the country to exploit more fully its comparative advantage and adapt its resources and internal economic organization to the pressures of world market demand and international competition; this helps keep the less developed country open to new ideas, new wants, and new techniques of production and methods of organization from abroad.

It is sometimes argued that reliance on exports exposes a country to unstable prices and hence unstable overseas income. On the other hand, the economies of low income countries are usually extremely "brittle" and subject to frequent internal instability in the face of unforeseen changes, such as a bad harvest threatening the country's food supplies. Internal disruptions arise from poor transport and communications, inadequate inventories of goods, lack of confidence aggravated by domestic inflation, and a generally underdeveloped market system. Thus it is possible to argue that the less developed countries' vulnerability to internal shocks can be reduced by freer international trade offering an elastic world market supply of goods on which to rely during their frequent emergencies.

With regard to the American-affiliated islands of the Pacific, it is worth noting that a major emphasis on exports and the exposure to new ideas, wants, techniques of production, and methods of organization from abroad could lead to cultural and social conflicts for those islands (particularly Micronesia), which have been largely protected from potential exploitation and thereby isolated from foreign influence.

(3) Population control.

In order to achieve the higher per capita income made possible by more rapid economic growth, there is a need to control the rapid population growth typical of the less developed countries.

(4) Steady improvements in the absorptive capacity for capital, trade, investment, and technical innovation.

The most general lesson is the importance of steadily improving the absorption capacity for capital, opportunities for economic growth, international trade, foreign investment, technical innovation, etc. An effective institutional

and organizational framework must be developed to carry out efficiently the allocation of resources. In the private sector, this requires the development of a well-articulated market system which embraces markets for final products and markets for factors of production--largely free of controls that significantly distort prices and interest rates. The market system must spread to bring underutilized land and labor of the subsistence economy into export production, and it must intensify in terms of growth of more specialized markets. In the public sector, the development of the organizational framework requires improvements in the administrative machinery of the government, especially in its fiscal processes.

D. Agriculture as a Development Strategy for the American-Affiliated Islands of the Pacific

For the small, American-affiliated tropical islands in the Pacific, there are a number of reasons to focus upon agriculture as the driving force for development.

(1) Need for economic development to relieve socio-economic problems.

In many of these island groups, widespread unemployment, low personal incomes, heavy dependence on welfare, and extensive social problems exist. Hence, there is a need for substantial economic growth of the type which directly addresses these problems. This need has been inadequately addressed to date.

(2) Lack of promising economic development alternatives.

Most of the economies of the American-affiliated islands of the Pacific are dominated by Federal expenditures, with very little other basic economic activities. Further growth in Federal expenditures is not promising, and in fact may decline eventually for those islands scheduled for free association. The potential for other sources of economic development appear limited to a few activities--namely, agriculture, limited tourism, some commercial fishing, and leasing fishing rights to others (i.e., Japan, Taiwan, Korea). The respective island governments must decide which of these activities to pursue and to what extent, based on an assessment of such factors as their potential, feasibility, profitability, and compatability with other economic activities and with their culture.

All of the above-mentioned potential activities have their difficulties. For example, tourism is not only difficult to develop on remote islands, but

for some islands, the required cultural changes and impacts may be unacceptable. Large-scale commercial fishing requires specialized skills, changes in life-styles involving prolonged periods at sea, and sophisticated and expensive equipment that is difficult to maintain.

Even though economic development will be difficult, it must be pursued in order to relieve socio-economic problems. As discussed below, agricultural development does have promise.

(3) Potential for a successful agricultural development program.

Up until a few decades ago, most of the islands were nearly self-sufficient with regard to their food supply. But since then, under the influence of the "war on poverty" and other federal programs, agricultural activity has fallen off to such an extent that many areas are now almost totally dependent on imported foods. Some of these imports can be grown locally, while for others local foods are good substitutes.

The prior existence of healthy agricultural industries under both local and foreign influence (except for certain islands where agricultural activities were subsidized by the Japanese during the 1920s and 1930s) indicates a potential for success that should be compatible with the various local cultures.

Agricultural potential is regarded as particularly promising for select high islands which are relatively rich in resources. But even the atoll islands in Micronesia may have significant agricultural potential, as indicated by the successful growing of certain root crops, vegetables, melons, grains, and citrus, in the Marshall Islands by the Taiwanese.

In pursuing this promise, the American-affiliated islands can draw upon a vast store of scientific and technical knowledge--knowledge which may not be developed sufficiently to allow immediate specification and application of profitable tropical-agricultural practices, but which, nevertheless, will provide a well developed base from which to work and a head start in their agricultural development.

(4) Agriculture as a driving force for economic development.

Arguments for a strong role for agriculture in the development plans of the subject islands include those already covered, namely the historical precedence (Section C) and future potential (Item 3). Additional and more detailed arguments which have been put forward for developing countries, and which apply (although for some items to a minor extent) to the American-affiliated Pacific

islands include:

--The need to conserve foreign exchange by avoiding the importation of expensive overseas food, and the need to earn foreign exchange by exporting food. (This need is only partially applicable to those islands which benefit from free food provided under Federal programs.)

--The need to meet the food and nutritional requirements of a country. (A need which again is only partially applicable to those islands which benefit from Federal food programs.)

--Adequate local food production is essential to national security: no government can afford to be dependent on unpredictable foreign (or Federal) sources of staple foods, or to allow local shortages to force food prices up to the point that consumers will revolt.

--Increased agricultural output provides increased employment and income to farmers, which, in most countries, constitutes a large proportion of the population. The resulting increase in rural prosperity in turn contributes to the building of markets for goods and services of urban businesses and industry, thus providing employment and increased incomes for nonfarm people. Agriculture may also be a source of the capital needed for other economic development to the extent that it provides a surplus that may be converted into the funds needed to purchase equipment or to build roads and provide public services.

--Agriculture can be made much more productive with the proper investment in research, fertilizers, insecticides, herbicides, irrigation, infrastructure, etc. The cost for such items as irrigation systems, roads, port development, and other facilities may be large, but they do not require the massive amounts of capital that industrial or many other types of development require.

(5) Growing support for agricultural development.

Members of the Pacific Basin Development Council, comprised of the governments of American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, and Hawaii have indicated increasing support for agricultural activity. In Micronesia, support of agricultural development can be expected to increase in the Federated States of Micronesia, Republic of Belau, and to a lesser extent, the Marshall Islands. This expectation reflects the fact that the need for new economic activities will increase, as U.S. funding for these areas is gradually withdrawn over the next 15 years or so, as called for in the current agreements

for ending the Trust status. The Marshall Islands, however, will continue to receive U.S. funds for the use of Kwajalein.

(6) Interest in developing a cooperative arrangement with Hawaii.

To varying degrees, public officials for the subject islands have expressed interest in working much more closely with the University of Hawaii's College of Tropical Agriculture and Human Resources. They have recognized that research is required for successful agricultural development, and that their current level of research is nearly non-existent or inadequate for most island groups. The tropical agricultural research resources of the University, the common language, relatively direct and frequent air transportation, and past contacts (frequently as former students), are some of the reasons for this desired affiliation.

(7) Importance to the United States.

A number of the island groups being addressed have made up the Trust Territory, administered by the United States since World War II under a United Nations charter. The trust status is programmed to end soon, at which time three "free associations" will emerge, along with the already established CNMI. However, the United States has thus far failed to prepare the economies of these island groups for their new political status.

The strategic military importance of these islands and the potential international implications of their economic health (or lack of it) argue for an accelerated economic development program. Furthermore, stronger, more diversified island economies would reduce requirements for long-term U.S. financial assistance.

(8) Importance to a multitude of similar island economies and other tropical areas.

Lessons learned from successful agricultural development programs for these American-affiliated islands of the Pacific should have benefits far beyond these particular islands. The results may also be applicable to thousands of other tropical and subtropical islands scattered throughout the world. Furthermore, the research on tropical island agriculture could have far reaching applications in that most of the food-short developing countries also are located in the tropics.

(9) Opportunity to accelerate and guide agricultural development in the Trust Territory Islands.

Under the free association agreement now being negotiated, the Marshall Islands, the Republic of Belau, and the Federated States of Micronesia will

receive at least $1.19 billion from the U.S. over the next 15 years; at least 40 percent of this, or about one-half billion dollars, must go for capital improvements. This provides a unique opportunity to accelerate agricultural development by guiding a portion of these funds to programs and infrastructure projects which support agriculture.

Also, it has been proposed that 25 percent of the funds provided under the Food Stamp Program for Guam and the Northern Marianas be spent on locally grown food. This would provide a substantially new incentive to farmers to increase their production.

The new political status for the Federated States of Micronesia, the Republic of Belau, the Commonwealth of the Northern Marianas, and the Marshall Islands will also provide new income sources. For example, there may be the sale of rights to fish within 200-mile jurisdictional limits to such countries as Japan, Korea, and Taiwan. A portion of these funds can be spent on agricultural development.

Finally, under the Omnibus Territorial Act of 1980 (P.L. 96-597), Section 601c, certain U.S. agricultural programs may for the first time be extended to the American-affiliated Pacific islands:

> The Secretary of Agriculture is authorized to extend, in his discretion, programs administered by the Department of Agriculture to Guam, the Northern Mariana Islands, the Trust Territory of the Pacific Islands, The Virgin Islands, and American Samoa. ...(T)he Secretary is authorized to waive or modify any statutory requirements relating to the provision of assistance under such programs when he deems it necessary in order to adapt the programs to the needs of the respective territory; PROVIDED, that...(he)...notify the Committee on Agriculture and the Committee on Interior and Insular Affairs of the House of Representatives and the Committee on Agriculture, Nutrition, and Forestry of the Senate...of his proposed action together with an explanation of why his action is necessary and the anticipated benefits to each territory affected. Such programs shall be carried out in cooperation with the respective governments of the territories and shall be covered by a memorandum of understanding between the respective territorial government and the Department of Agriculture.

(10) Uniqueness of study and opportunity for new knowledge.

Even though there are many thousands of tropical and subtropical islands scattered throughout the world, proven agricultural development plans and approaches for such islands are lacking. This is particularly the case for the American-affiliated islands of the Pacific. Yet, these islands provide a unique learning opportunity in that many of them are in a relatively early stage

of development, and their economic, political, and social structures are relatively small and simple compared to other areas. Valuable lessons can be learned from the experience of developing an agricultural sector almost from scratch in a relatively simple and easily understood environment.

II. TYPICAL CONDITIONS AND PROBLEMS RESTRICTING AGRICULTURAL DEVELOPMENT

A. Introduction

Over recent decades, food production for most of the American-affiliated Pacific islands has declined from near self-sufficiency to heavy dependence on imported foods. Repeated attempts have been made to encourage investment and development in agriculture, but the results have been disappointing. Many reasons have been given for the extreme difficulty in attracting agricultural investment and motivating people to farm--reasons which are reviewed in the following pages. The problems and conditions cited are typical of most, but not all, islands. Also, some of the problems cited as being causes of the poor performance of agriculture may in fact be due to the unprofitability of the industry; if the current incentives prevent profitable farm operations, resources and effort will not be invested in support of agriculture.

The principal factors constraining agriculture in the American-affiliated Pacific islands include the following: natural and ecological constraints, limited availability of land, limited availability of water, physical infrastructure deficiencies, scarcity of key inputs--capital, skilled labor, equipment, fertilizers, etc., small size of local market, distance from overseas markets, lack of market incentives, inadequate institutional support, a generally negative attitude toward farming as an occupation or vocation, and government policies which are inappropriate or inadequate for promoting agricultural development. Neither this listing nor the following discussion is necessarily in order of importance or urgency. For the most part, these factors are closely interelated; and it is the interrelationships that must be confronted in the formulation and implementation of new policy directions.

B. Natural and Ecological Constraints

Farming in the American-affiliated Pacific Islands must cope with formidable natural and environmental constraints. Although crops can be grown year-round for the most part, frequent tropical storms, drought conditions during the dry season, poor soil fertility, high susceptibility to crop damaging pests and diseases, rapid weed and vegetation growth, rugged topography, soil erosion problems, and limited water resources are some of the main natural constraints

which contribute to high risk of crop losses and elevated production costs.

Soils on most tropical islands are thin, susceptible to erosion, and deficient in nutrients--particularly nitrogen, phosphorous, potassium, and other minor elements. The high temperatures and rainfall cause organic matter to decompose quickly, leaving the soil deficient in humus.

Many of the natural constraints cannot be removed, but alternative means of coping with the adverse conditions can be found. Some of the naturally adverse conditions can be offset or eliminated, but usually by incurring heavy costs of capital investment, research and development, or use of special inputs such as pesticides and chemical fertilizers.

C. Limited Availability of Land and Water

The islands are further constrained by their small size. For example, the 2,141 islands of Micronesia have a total area of less than half that of Rhode Island. Furthermore, many of the high islands which have the more fertile soils have hilly terrain. Consequently, there is a scarcity of level, fertile land; the major exceptions are parts of the Commonwealth of the Northern Marianas. Thus, for most islands, large-scale, mechanized commercial operations are infeasible.

Privately-owned land used for agriculture and available for use tends to be held in small parcels (less than five acres). Since high social value is attached to land ownership, land is passed from one generation to the next and is frequently subdivided as families grow. Fragmentation of private parcels together with multiple ownership results in less suitable land being available for farming.

Compounding the problem is the fact that land surveys and title claims are incomplete or contested, thus immobilizing lands that could otherwise be used for agriculture. Further, leasing procedures for the long-term use of suitable public or private lands have not been developed. In the absence of controls, land may also be used for multiple purposes, placing further restraints on efficient land use.

Of special concern is the protection of underground water resources and development of additional surface water sources for urban as well as agricultural uses. While certain crops may be grown which require less water than most, other crops in demand probably will need irrigation waters during the dry season

to be commercially viable on any significant scale. It is apparent that the costs of developing irrigation systems must be weighed against the benefits of expanded production of those crops which will require water.

D. Physical Infrastructure Deficiencies

Besides the lack of distinct water resources and distribution systems for irrigation, other infrastructural needs include access roads, utilities, and associated site development work to open up additional government and privately-owned lands which have been designated for agricultural use.

In terms of marketing and distribution requirements, identified needs include storage, refrigeration, and handling facilities for fresh fruits and vegetables and other commodities. Food processing facilities for swine, chicken and vegetables have also been cited as pressing needs in Guam and American Samoa. These facilities would provide an alternative means of marketing fresh vegetables and livestock, in effect enlarging the market and contributing to more stable prices and supply.

With sufficient investment, problems of inadequate infrastructure (roads, harbors, airports, electrical power, telephone system, water, irrigation, etc.) are normally solvable. Although the cost of providing new or improved infrastructure may be high, such projects are often cost-effective because of the multiple benefits which may result.

E. Scarcity of Inputs

An extremely limited supply of capital for agricultural purposes is another significant restraint. Presently, government funded loan programs are virtually the only source of loan capital available to farmers. The small size of commercial agriculture, and high risk of farming, has precluded the extension of private development and credit loans. From this financial limitation may be derived the major physical constraints to development in terms of lack of farm equipment, skilled labor, fertilizer, and other inputs. In the early stages of an accelerated agricultural development program, the largest burden will have to lie with the government to demonstrate progress in resolving these restraints, in addition to providing or facilitating the extension of more capital to farmers. As the commercial returns to farming increase, along with a reduction in risks of loss, private lenders may be expected to participate.

Few private sector services are available for supply farm inputs (seeds,

feeds, fertilizer, pesticides, herbicides, etc.), machines and parts, and information on how to properly use the inputs and machines. Also, crop insurance is generally not available.

If agricultural inputs must be imported, they can be very expensive, as is the case for fertilizer, pesticides, herbicides, animal feeds, and farm equipment and machinery. Because of this expense, many farmers lack the valuable experience of working with imported agricultural inputs which may, in fact, be more cost-effective.

F. Small Size of Market

Marketing is a major problem of the islands under discussion. First, the various domestic markets are very small, as indicated by the following 1980 population estimates:

Island Group	Population
Guam	105,800
Commonwealth of the Northern Marianas	16,862
Marshall Islands	31,042
Republic of Belau	12,177
Federated States of Micronesia:	
Ponape	22,319
Truk	37,742
Yap	8,172
Kosrae	5,522
American Samoa	32,395

In common with other Pacific islands, the size of the local market is small in terms of the amounts of any particular commodity that can be produced. Farm operators utilize a variety of modes for marketing output. While size of market in itself acts as a restraint in the absence of export markets and sales to local food processors, the current channels of distribution for fresh produce are inefficient. Given the small market, lack of efficient distribution channels results in unstable supply and absence of quality standards. This means higher risks to farmers because of unstable prices, spoilage, and inability to satisfy the demand of institutional buyers. Although consumption data are not satisfactory, available information suggests that a large amount of food is grown for household

consumption and thus never enters the marketing system.

Over the decades, there has been a growing preference for imported foods. A major reason for this trend is that free American foods have been made available to school children and others under U.S.D.A. programs. Another reason is that convenience foods such as rice can be cooked far more easily and quickly than can the traditional starches.

Preferred foods of most island groups include fish, chicken, pork, and starches, but in many cases exclude fruits and vegetables. So even if certain fruits and vegetables can be shown to thrive on certain islands, the domestic demand may be weak, especially if the foods require unusual cooking or preparation.

G. Distance from Overseas Markets

Another significant restraint to agricultural development is the location of the islands in relation to input supply markets and potential commodity export markets. The nearest sizeable markets are Japan, Philippines, Taiwan, and Korea, all located at a distance of 1,500 miles or more. However, it is not just physical distance, but the fact that shipping and air freight routes do not connect with the islands for the most part. For the relatively few companies that do serve the territories, the cost of providing services is relatively expensive, given the low volume of freight flowing to and through the island.

A major problem which limits agricultural exports from Guam and Micronesia to the major Asian markets is foreign competition. If a profitable export crop is identified, it can generally be grown at a lower cost and larger scale in other countries. For example, Taiwan has a favorable tropical climate, considerable land, a well-developed agricultural system, proximity to a well-developed delivery system for servicing the nearby Asian markets, skilled labor that is less expensive than that of the American-affiliated islands, research support, and other significant advantages.

To develop a competitive agriculture which can supply large segments of the domestic market on an import substitution basis and also export selected specialty commodities to overseas markets, productivity must be high or the commodities must be unique. The task of increasing productivity for crops suitable for the local market and identifying and developing viable export

commodities is extremely difficult, as the experience in Hawaii has proven. This is a critical area in which government support is essential.

H. Lack of Market Incentives

Perhaps one of the most critical areas that must be addressed in designing a successful agricultural development program is that of insuring that adequate incentives exist to induce an increased output.

Currently, few incentives exist in the islands to reduce the risk of farming and enhance the profitability of commercial production. A variety of services are provided the farmers, but in general, adequate incentives are not available. Specifically, the area of market support designed to stabilize commodity prices deserves concentrated attention. This is especially crucial given the small markets involved.

A primary reason for the poor performance of the agriculture industry on most islands is that the product prices provide insufficient incentive for farming. And a major cause of the low prices commanded by agricultural products is the availability of below-cost food provided under U.S.D.A. food programs.

I. Inadequate Institutional Support

The socio-economic institutions or social infrastructure which are necessary for growth and development of commercial agriculture is another critical area. Component parts of the social infrastructure for agriculture usually include the industry cooperatives, public markets, Departments of Agriculture, Cooperative Extension Services, Agricultural Experiment Stations, and programmatic support from other local agencies in the areas of capital loans, special studies and plans, utility services, and transportation facilities.

The level of effort (funding, number, and quality of personnel) and degree to which the institutional components are effective in carrying out their programs should translate into positive market incentives, increases in productivity, introduction of new and/or superior commodities, enhanced quality of commodities, and increased profitability and lower risk in farming. This generally will be true if government policies are consistent and facilitate growth, and if the development planning program is well-conceived and coordinated. The absence or ineffective coordination of these institutions has proved a major impediment to this growth.

While progress has been made in institution-building, a number of weaknesses have been noted. With respect to marketing and distribution, prices are highly volatile, and supply is irregular and often of poor quality. Membership in cooperatives is low, and management and facilities need upgrading; some members do not always participate in marketing their production through the cooperative. The crop forecast and pricing information system to serve farmers has not been available at times or is non-existent in some places. Commodity quality standards do not exist or are not enforced. There is very little use of commercial contracts to ensure continuing demand and price levels between cooperatives (or farmers) and large scale buyers.

In terms of potentially important support programs which affect farmers' risk and costs of production, there is a lack of funding, or more often the case, an inadequate program design. The several loan programs available to farmers have very little resources, and consequently, few loans (and in small amounts) are made. Very little formal training in agricultural skills is being given especially in secondary and post-secondary vocational and technical areas. Extension services appear not to be utilized effectively, and research and development efforts have not been brought to bear on island problems.

J. Negative Attitudes Toward Farming

Agricultural activity is not pursued for its own sake; those who would farm have certain expectations associated with both the economic returns and the nature of their work and style of living it affords. The larger community, too, has certain attitudes, values and expectations relative to agriculture.

The clan system prevalent in much of Micronesia and American Samoa is a recognized problem for successful agricultural development. First, little incentive exists for an islander to farm or pursue other employment in order to obtain cash since generally he can meet his needs from a family member who works for the government, and/or he can receive welfare payments.

Further, it may be difficult to obtain use of the land and an obligation exists to share the products with relatives and others. If the products are not shared, the individual is ostracized by the village. With subsistence agriculture, these problems may be tolerable. But with participation in a cash economy, these problems become quite serious. If cash must be paid for

imported agricultural inputs (such as fertilizer, equipment, etc.), but not all of the products can be sold, insufficient funds may exist to cover the cost of these inputs. The problem is even more serious if funds must be borrowed to pay for the imports. Thus, little incentive exists to save, invest, or pursue innovative business schemes, and there is little or no reward for entrepreneurship. For government policy makers who represent the larger community, it is important to recognize that the goals, objectives, and associated policies set for agriculture must not only satisfy the values and expectations of farmers, but also be consistent with social traditions, attitudes, and behavior.

K. Inappropriate and Inadequate Government Policies

Government policies, and plans, and programs are of obvious importance in building a productive agricultural sector which can contribute significantly to overall social and economic goals. This is particularly so in view of the imposing list of physical, social, and economic constraints which have limited Pacific island development. Policies and plans not only guide the allocation of public resources, but also indicate the direction and extent of commitment that the government will follow in pursuing agricultural development. This is important for mobilizing private investment and support for agriculture. Policies also directly and indirectly shape the incentives that affect the behavior of farmers and others involved in or who relate to agriculture; Federal as well as territorial policies must be considered. These policies may be implicit or indirect, as well as explicit.

Given the very high dependence of these islands on outside sources of food, the apparent absence of interest on the part of the federal government in promoting agricultural development is surprising. The military establishment in Guam imports large amounts of food, much of which could conceivably be supplied by the local agricultural sector, were it more productive than it now is. Suitable land and other resources are available to meet these needs, but a broadly based development program entailing substantial federal participation is required.

Current territorial agricultural plans and policies have indicated the goals of making these islands less dependent on agricultural imports, promoting commodity exports, and diversifying the territories' economic base through import substitution and increased production of agricultural commodities. Stated policies have been concerned mainly with providing support infrstructure, improving the marketing and distribution programs, and promoting

larger scale commercial (as opposed to small operations) agriculture -- especially through use of long-term leases on government land. In general, the specific means for achieving increased exports and production for import substitution have not been detailed, and the social and economic implications of pursuing stated policies have not been discussed.

Even though the various island governments profess support for agricultural development, many fail to fund adequately or provide meaningful support for agriculture. This appears to be particularly true for those island groups which have other sources of income, such as tourism and U.S. defense expenditures. Conversely, where there is a lack of other income generating sources (such as for the Federated States of Micronesia and the Republic of Belau), the support for agricultural development appears to be stronger. For a number of governments, particularly those of Micronesia, foreign investment in agriculture or any other type of economic development has not been promoted actively. In fact, at least one government until recently did not even have an office charged with promoting economic development. Investors who showed interest were often not assisted actively. The decades of subsidies reduced incentives to attract outside investment.

The relatively minor government involvement in agriculture has been reflected in a limited development of infrastructure, funding of selected experimental projects, and occasionally the establishment of centralized markets. However, in general, a hands-off attitude toward private business has taken place, with little apparent knowledge or appreciation of the heavy role government has played in those countries (including the United States) which have established economically strong agricultural industries.

Although many factors interact to restrain agricultural growth, the review and assessment of these influences indicate that even though production is quite small at present, the resources and markets exist to enable a significant expansion of agricultural activity, given adequate funding and commitment. The fact that a larger, or productive agriculture will only be achieved at a definite and considerable cost, naturally requires a careful evaluation of the costs and benefits of available territorial development alternatives. The evaluation of such alternatives is not within the scope of this report. However, in assessing agriculture in the context of the overall island environment, it is quite apparent that exclusive reliance on the few development alternatives

that have been identified, to the continuing neglect of agriculture, would be short-sighted.

III. REQUIREMENTS FOR AN ECONOMICALLY HEALTHY AGRICULTURAL INDUSTRY

A. Introduction

This section discusses the requirements generally considered to be necessary or desirable in order to develop an economically healthy agricultural industry. Where possible, the factors are given for the typical conditions found on many of the American-affiliated islands of the Pacific.

Farmers will generally increase their productivity when the following prerequisites are met:

(1) An improved production system.

Combinations of materials and practices that are clearly more productive and profitable must be available to the farmer. They must have a lower level of risk than the methods currently in use.

(2) Instruction for farmers.

It must be demonstrated to the farmer, on his own farm or nearby, how the improved production system can be implemented, and he should understand why this is better.

(3) Supply of inputs.

Land and the inputs required--including, if necessary, credit to finance their purchases--must be available to the farmer when and where he needs them, and at reasonable cost.

(4) Availability of markets or benefits from production.

The farmer must have access to a nearby market that can absorb increased supplies without excessive price drops. The farmer must believe, before he invests in inputs, that at harvest time he can obtain prices which permit higher profits. Alternatively, if the farmer produces solely for the consumption of his family or clan, he must perceive that he obtains benefits from his actions.

If all of these conditions are met simultaneously, it is likely that a high proportion of farmers will, in time, change to the improved production systems. If the combination is incomplete in any respect, farmers will hesitate to abandon their traditional ways.

B. Resources

Obviously an economically healthy agricultural industry needs adequate supplies of such resources as fertile land, water and labor. Although only a few of the subject island groups have abundant areas of fertile land, all have climatic conditions that are conducive to certain types of crops and livestock.

C. Package of Practices

An essential requirement for agricultural development is the existence of an appropriate "package of practices"--the combination of materials and practices that is productive and profitable at an acceptably low level of risk. Crops and cropping systems should take advantage of abundant (and inexpensive) resources while minimizing the use of scarce (and expensive) resources. The technology used should maximize the return to the scarcest factor. For example, if land is scarce, then yields should be maximized. But if labor is scarce, productivity should be maximized.

Crops and cropping systems should also be tailored to the ecological, climatic, seasonal variations and soil conditions for each major growing region. Furthermore, the cropping system must be compatible with local customs--it should not create peak labor demands that conflict with other needs. Until hardy and profitable crop varieties and systems are developed, investment in other factors designed to accelerate agricultural development may have little payoff.

As previously indicated, "packages of practices" appropriate for the tropics are few. Crops and crop systems that are generally appropriate to the small American-affiliated tropical islands in the Pacific include:

(1) Hybrid crops that:
   --are resistant to pests, disease, and weeds;
   --thrive in nitrogen-deficient soils;
   --are slow to rot;
   --require little or no irrigation; and
   --produce high yields per unit of time (not per plant).

(2) Legumes because they leave nitrogen deposits in the nitrogen-deficient soil and have high nutritional value.

(3) Seasonal and root crops that suffer minimal damage from the occasional intense tropical storms, or such crops as papaya and bananas which recover rapidly.

(4) For export, crops that are high-value, of low weight and bulk, are slow to rot, and can compete with Taiwan because of special production or transportation advantages, or inability by Taiwan to satisfy market demand.

(5) Intensive, high-yield, multicropping garden systems appropriate for small farms, often on hilly terrain, and which minimize risk and create even labor requirements.

(6) Systems which do not demand sophisticated skills and which require relatively little labor, thus reflecting the generally unskilled labor and high (even if artificial) wage rates.

(7) Minimum use of mechanization, thus avoiding problems of obtaining spare parts.

(8) Where mechanization is appropriate, use of small-scale equipment.

(9) Mechanical cultivation over herbicide weed control because of reduced energy-related costs.

(10) Use of insecticides only when and where serious infestation threatens as opposed to periodic application regardless of threat, thus reducing cost and avoiding potential disruption of the ecology and pollution of water sources.

(11) Use of animals as a source of manure, a means to convert and store excess crops as well as crops unsuitable for human consumption, a means to clear land, and as a source of protein.

(12) Use of contour tillage, contour strip cropping, and/or sod cropping on steeper slopes to lessen hazards of erosion.

(13) Use of compost and other organic fertilizers, returning all crop residues to the soil, rotating crops, and use of small amount of commercial fertilizers occasionally in order to overcome problems of losing soil fertility through leaching and erosion.

(14) Use of lime in some areas for such crops as coconuts to compensate for calcium and toxic aluminum levels, with the lime obtained from crushing local coral sands.

(15) Crops that require relatively little use of expensive inputs in order to avoid a dependency on financial credit.

Technology inappropriate to small tropical islands include that typical of the United States mainland, which is based on a temperate climate, abundant land, large farms, scarce labor, and highly mechanized crop production.

Aside from the crops previously mentioned, appropriate packages of practices may be devised for:

--replacing old, unproductive coconut trees with new higher yield varieties, and introducing better cultural practices;

--bananas for export from Micronesian islands to Guam and possibly beyond;

--citrus fruit for export to Australia, New Zealand, and elsewhere;

--eels in Guam for local consumption and export;

--eggs in Guam for export;

--muskmelons in Guam for export to Japan provided import requirements can be satisfied;

--beef, pork, meat products, and live cattle in the Northern Marianas for export to Japan;

--row crops on unused government land in Ponape;

--export of guava, citrus, and passion fruit juices involving yet-to-be-built processing plants;

--export of ginger;

--hydroponic garden crops; and

--marine, and possibly some freshwater aquaculture for export.

Many countries continue to debate whether to emphasize exports or to substitute exports with imports. For the American-affiliated Pacific islands, a dual strategy of pursuing both export and import-substitution crops is probably best. Results are easier to achieve with import substitution because of the large number of crops which can be used. But the growth potential may be severely limited by the small market size. On the other hand, it is very difficult to identify and develop an export crop which eventually will be profitable against foreign competition, but the rewards can be enormous.

D. Research

In order to develop and improve appropriate packages of practices, an on-going research program, which is linked to the nation's development process, is essential.

The types of agricultural research needed for many small-island economies include:

--Operational or farm-level research, whereby the combinations of crop and animal production practices that will provide higher productivity and

profitability are identified through experimentation on farms, mostly by farmers themselves.

--Tactical research at research field stations, including tests on new varieties, fertilizer practices, methods of controlling diseases and insect pests, new production practices, and other components of farming systems.

A research field station should be located in each major agricultural district. Most district centers do in fact have such a research center.

Types of agricultural research supporting small-island economies but best conducted at a large research center, such as the UH CTAHR, include:

--Strategic research aimed at solving major problems affecting several areas, or at developing new approaches to improve production of crop or animal species.

--Basic research with no specific predetermined use necessarily in mind.

Agricultural research support in Guam is of course provided by the University of Guam. But since their capabilities are limited, they turn to the UH CTAHR when needed. Both the UNIVERSITY OF GUAM AND THE GUAM GOVERNMENT appear comfortable with this arrangement and WOULD in fact LIKE TO SEE FURTHER COOPERATIVE ARRANGEMENTS, INCLUDING PARTICIPATION IN THE 406 PROGRAM.

The Commonwealth of the Northern Mariana Islands uses the University of Guam for their research needs and the UH CTAHR for backup.

The Marshall Islands are being assisted in their farm-level and tactical research by the Taiwan government. This service is provided free, presumably because of interest by the Taiwanese in obtaining rights to fish the nearby waters.

The FSM and Belau lack any formalized University-level agricultural research support, although the University of Arizona currently has an informal presence in Truk, and contacts have been established with Asian countries. Both FSM and Belau place a high priority on agricultural development. In their judgment, Guam will continue to be too small to serve their needs adequately, and the University of the South Pacific is too remote and difficult to visit. Consequently, they prefer to develop closer relationships with the UH CTAHR because of its strong research and training capabilities and the adequate transportation to Hawaii. Furthermore, THE FSM, ESPECIALLY THE AGRIGULTURAL OFFICIALS ON TRUK, HAS EXPRESSED INTEREST IN HAVING AN ON-GOING UH CTAHR RESEARCH PRESENCE,

POSSIBLY JOINTLY FUNDED. Responsibilities would include research, training, and assistance in conducting feasibility studies. This presence would lend additional status to recommendations for agricultural development.

REQUESTED OR DESIRED UNIVERSITY-LEVEL RESEARCH IN SUPPORT OF AGRICULTURAL DEVELOPMENT IN MICRONESIA AND AMERICAN SAMOA INCLUDE RESEARCH ON:

--identification of insects in Ponape;

--disease problems affecting breadfruit and arrow root;

--control of mealy bugs;

--ways to control weeds and insects without using polluting and expensive chemicals;

--ways to prepare root crops quickly and easily so that they can better compete with imported convenience foods;

--ways to overcome the seasonality problems of breadfruit and taro, such as development of varieties which would provide high yields year round or during the off season, or ways to store or preserve them;

--plant nutrition;

--soil conservation;

--ways to improve extension services;

--modifications to existing institutions that would improve the incentives to farm;

--development of rainfed farming systems because of the scarcity of irrigation systems; and

--feed for pigs, poultry, and other animals which can be grown locally.

In support of the above, many have expressed a need for PUBLICATIONS AND NEWSLETTERS WHICH DESCRIBE THE CAPABILITIES OF THE UH CTAHR, ITS CURRENT RESEARCH ACTIVITIES, AND PAST AND RECENT RESEARCH FINDINGS.

E. Extension Services

After appropriate packages of technology have been developed, they must be communicated to and understood by farmers. Where a new technology is clearly superior and more profitable, the communication and spread of the new approach almost takes care of itself.

Generally, the communication of new farming techniques requires that the farmer be shown how to do the new practices on his own or on a nearby farm, and he must understand why the new practices are better. In this sense, the extension

agent should be equipped to help educate the farmer and act as an agent for change. He should be credible, and competent in technology, farming, economics, and communication skills. And ideally, he should be supported with an extension station having an agronomist, agricultural engineer, entomologist, animal specialist, agricultural economist, and a communications specialist. However, a major problem in improving the extension services for the American-affiliated islands of the Pacific is the small size and widely scattered nature of the potential farmer population. This makes it extremely difficult to justify the ideal extension station indicated; thus the various functions would have to be covered by a few well-qualified experts having backgrounds that cover multiple specialties.

In addition to communicating new technology developments to farmers, the extension service should be organized and coordinated so that the problems of farmers are communicated back to researchers, public agencies, and agricultural supply firms. This backward communication is currently weak for most of the subject islands, particularly for communicating back research needs to the UH CTAHR and elsewhere since the needed arrangments do not exist.

In some areas (such as Yap and Belau) subsistence agriculture is the responsibility of women. This not only leads to a low priority for agriculture, as previously indicated, it may lead to communication barriers between male extension agents and the women who farm. It is often considered inappropriate for men--particularly men from a different culture--to teach women; introduction of new ideas or new techniques must pass from woman to woman, or they will not pass freely. Because of this, female extension agents should be used in cultures where farming is done by women.

F. Education and Training

As indicated previously, there is a need on many islands in the Pacific to train future farmers. More specifically, there is a need for:

--improvements in the general level of education;

--development of farm programs in schools at all levels;

--development of intern programs to provide future farmers experience with researchers, extension services, and government agencies, thus involving these organizations in the training of farmers; and

--involvement of farmer education and training organizations in the agricultural development program, thus contributing to the relevance of the

training programs.

Low education levels of potential farmers may present a problem, but certainly not an insurmountable one since certain Asian countries with even lower educational levels have sustained healthy agricultural industries. Where education levels are a problem, students can learn through non-written communication methods which may be utilized to transmit the required information.

EDUCATIONAL AND TRAINING ROLES WHICH HAVE BEEN SUGGESTED FOR THE UH CTAHR ARE (1) FREQUENT (QUARTERLY) TRAINING PROGRAMS DESIGNED SPECIFICALLY FOR MICRONESIAN AGRICULTURE, WITH STRESS ON SHOWING RATHER THAN TELLING, AND WITH THE TRAINING CONDUCTED IN HAWAII AS WELL AS IN MICRONESIA; AND (2) DEVELOPMENT OF AGRICULTURAL SCHOLARSHIPS FOR THE FSM WITH ONE OR TWO SCHOLARSHIPS AVAILABLE FOR EACH OF THE FOUR DISTRICTS.

G. Production and Training Centers

Research, production, and training centers should be established or strengthened in key areas. Their functions would include:

--"tactical" research;

--serving as a headquarters for technicians undertaking "operational" or farm-level research;

--serving as a center for initial increases of improved varieties or animal stock; and

--serving as a center for individuals of other service agencies.

--provide facilities (storage, refrigeration, drying, process, transportation, etc.) as needed.

Staffing of the center ideally would include an agronomist, an agricultural engineer, an entomologist, an animal specialist, an agricultural production economist, a communications specialist, and a director. But similar to the problem of the ideal extension station mentioned above, the current and potential agricultural activities on most of the subject islands are too limited in scale to justify the ideal staffing. Again, the various functions generally will have to be covered by a few well-qualified experts with backgrounds in a range of specialties.

H. Input Supply Markets

In order to implement new practices, the farmer will need the necessary inputs, including seeds, fertilizer, pesticides, herbicides, and financial

credit. These inputs should be provided at a reasonable cost, in the quantities needed, and from a single market near the farms. Low-cost (but not subsidized) credit available to small farmers is of critical importance since most of these inputs will require cash payments.

For most of the subject island groups, such input supply markets are available only in the district centers and then only to a limited extent.

Government supply companies should generally be avoided in favor of the normally more efficient private companies. If needed services are not available from the private sector, it may be worthwhile to contract for the services.

I. Commodity Market

As farmers generate excess production, markets are needed for disposing of this surplus. Ideally, these markets should:

--be nearby;

--be located where the farmers' inputs are purchased;

--be able to absorb the increased supplies without an excessive price drop;

--provide and distribute widely accurate and timely information on price, including product prices which are provided sufficiently early to allow timely planting decisions; and

--provide facilities (storage, refrigeration, drying, process, transportation, etc.) as needed.

In order for the markets to work effectively, regulation may be needed to standardize and maintain honesty in weights and quality.

Markets having the features described above are difficult to develop where farmers are dispersed over an extensive area and transportation of products to market is difficult. Commodity markets have, in fact, been established in nearly all of the district centers, but they fail to provide the full range of services desired. Development of these services should be encouraged, along with such institutional markets as schools and hospitals.

J. Market Incentives, Prices, Controls and Subsidies

Adequate incentives, generally in the form of favorable input and output prices that allow higher profits, are needed to induce farmers to take the risk to adopt new practices, innovate, and work harder. In fact, given proper

incentives and an appropriate "package of practices," farmers usually respond favorably and are able to solve problems which were thought to be restraining agricultural development.

Ideally, prices are communicated through a well functioning, efficient market that provides clear signals. But such an ideal market seldom exists. Imperfections in the private marketing system of developing countries seem to be due largely to lack of transportation, an infrastructure which limits access to and among markets, inherent uncertainties of supply and demand, and seasonal scarcities of stocks which result in price instability. Therefore, even in normal times, and more so in times of extreme shortages or of rapid growth in production, some government intervention is warranted.

Improvement of market effectiveness may come from a dual approach. Where feasible, the private market should be reinforced. This can be done by improving information to farmers and between markets, enforcing uniform practices, experimenting with managerial and institutional innovations, improving storage, and improving transportation to and among markets. Where it is demonstrated that this approach is not sufficient, the private market should be supplemented by public operation.

In order to provide adequate incentives, temporary price intervention may be justified. In particular, it is justified if:

--existing price levels provide inadequate incentives to induce farmers to adopt new practices;

--it can be expected that farmers will in fact respond by adopting new technology and continue with the new methods after the temporary price intervention is withdrawn; and

--the government can withstand consumer pressures while the price intervention is in effect.

If price instability is the problem, then long-term price intervention to decrease the magnitude of the fluctuations may be justified. Stability has been a powerful incentive in increasing production and, for most farm products, requires government intervention.

However, input price subsidies and controls to enforce artifically low prices on inputs should generally be avoided. This includes subsidies and price controls for seeds, fertilizers, pesticides, irrigation water, credit, etc. The problems caused by below-market input prices are that:

--they are a dull policy tool that also benefits farmers who grow crops which do not need the subsidies;

--they drive private suppliers from the market, and their extension services are lost; and

--they do little to reduce risks to farmers since the uncertainty over future commodity prices remain.

If price intervention is justified in order to provide needed incentives to farmers to adopt new technologies, it should generally be in the form of commodity price supports. These price supports should:

--be designed to increase the level and stability of commodity prices;

--focus on just those major crops targeted for technology improvement and expansion;

--be announced sufficiently early so that farmers can make informed planting decisions;

--gradually drop over time in response to technology improvements and adaption by farmers;

--be defined objectively, not politically (possibly based on estimated average production cost);

--allow for regional differences reflecting distance from markets; and

--allow for seasonal variation.

The goal of the commodity price supports is generally to reduce costs of production (and the price supports) over the long-term, and thus increase production. However, price supports may also be instituted in order to reduce reliance on other countries for basic foods.

Once production increases, commodity price guarantees may be reduced to cover variable but not fixed costs. This reduces government subsidies, provides risk insurance to farmers, and encourages efficiency in the agricultural sector.

Commodity price supports may be implemented by: (1) placing restrictions on imports through tariffs, duties, and/or quotas, and (2) providing minimum guaranteed government purchase prices during bumper years, with subsequent sales abroad or, for non-perishable items, sales at a later date during periods of shortages. This second approach is implemented in the U.S. through a loan/purchase program for non-perishable items. A farmer can get a loan using his crop as collateral, then satisfy his loan either with cash by selling his crop if the price is high, or forfeiting his crop when the price is low. The European

Economic Community favors import levies and export subsidies to maintain high and stable prices.

For American-affiliated Pacific islands, provisions of U.S. farm legislation will apply, except where special treatment is provided for or where the islands' political status enables them to enact special legislation. As previously indicated, proper incentives and price instability are a major problem in many islands, especially in Micronesia and American Samoa. An obvious and major problem is the free food provided under the U.S.D.A. food distribution programs. For many, this has eliminated the incentive to farm, since farmers cannot compete with free food. To correct this problem, THE U.S.D.A. FOOD DISTRIBUTION PROGRAMS SHOULD BE REDUCED GREATLY IN SCALE (TO THE EXTENT POLITICALLY FEASIBLE), WITH FOOD PROVIDED ONLY DURING EMERGENCIES. IN ITS PLACE, TECHNICAL ASSISTANCE SHOULD BE PROVIDED. AN ALTERNATIVE OR SUPPLEMENTARY APPROACH WOULD BE TO PURCHASE THE FOOD LOCALLY--FOR EXAMPLE, THE PROPOSED REQUIREMENT THAT A PERCENTAGE OF THE FOOD OBTAINABLE UNDER THE FOOD STAMP PROGRAM BE LOCALLY PRODUCED.

For these islands, an appropriate future pricing and marketing strategy may be to price products below the cost of buying and shipping the goods from the U.S. mainland, and to market amounts just short of saturating the market. The proper amount to market may require appropriate restrictions on production. In exchange for production limits, price guarantees may be offered.

Other justifiable subsidies include research, education, training, extension services, public infrastructure, and poverty relief programs.

K. Credit

In order to purchase needed inputs, farmers need access to credit. For the small farmer, the key is accessibility rather than subsidy. The experience of other developing areas has been that the diversion of limited capital funds in the form of cheap loans to the larger operators creates a greater capital scarcity and higher interest rates for the smaller operators. Furthermore, cheap loans encourage marginal activities, while more profitable ones may be abandoned because of a lack of funds. This results in not only a wasteful use of scarce capital resources, but also discourages growth of domestic savings and retards development of a domestic capital market. Finally, subsidized loan programs are difficult to

drop when the subsidies are no longer needed. In short, it is important to maintain market-level rather than subsidized interest rates in order to spur savers and prod borrowers into efficiency.

Special conditions on extension of small farmer credit should be avoided. Such special conditions include: restrictions on how the funds are to be spent, providing the credit in the form of vouchers to be spent only on inputs, minimum loan levels, collateral requirements, requirements for a detailed farm plan, special farm inspections, and complex papers. These special conditions usually do not increase productivity and succeed mainly in restricting credit availability.

Loans made to groups rather than individual farmers have the following advantages: they are easier to obtain; they provide pooled collateral and reduced loan fees; it is easier to enforce collection and to communicate information. Defaults can be reduced if it is clear that the sources of the loaned funds are the savings of neighbors, and if mobile banks are used to collect loan payments.

As discussed previously, credit to farmers is non-existent throughout most of Micronesia. To help circumvent this problem, some local governments provide tools and materials at cost, and allow the use of equipment at little or no cost. But this is surely an inefficient substitute for credit. Thus, it may be necessary to enact mortgage laws which conflict with traditional values regarding the use of land in order to develop a workable credit system. Furthermore, the custom of sharing with members of the extended family may present two additional problems. First, the farmer may have to share his production, and may not be able to sell enough to repay his loan. Second, he may not even feel a strong obligation to repay the loan.

Neither public or private banks are demonstrably superior. TO OVERCOME THE UNAVAILABILITY OF CREDIT, VARIOUS PACIFIC ISLAND OFFICIALS HAVE PROPOSED A PACIFIC BASIN REGIONAL BANK WITH INITIAL, THOUGH UNCERTAIN, FUNDING TO COME FROM THE FEDERAL GOVERNMENT.

L. Poverty Relief Programs

Poverty relief programs such as food stamps, can reduce the political pressure favoring low price controls on food and can make commodity price supports politically palatable--particularly if the two are clearly linked. Furthermore, the poverty relief program can be designed to assist agricultural development through

the aforementioned proposal that 25% of the food supplied under the food stamp program be purchased locally.

M. Buffer Stocks

It may be desirable for the government to accumulate buffer stocks in order to support prices during bumper years, and to provide supplies and reduce prices during shortage periods. However, buffer stock programs are costly and complex and for the islands under discussion, have questionable merit.

N. Infrastructure

Infrastructure needs for an economically healthy agriculture industry include the following:

--roads connecting farms to markets;

--water systems, including group pumps, catch and storage basins, transmission lines, irrigation lines, etc.;

--small storage facilities to protect crops from pests and mold;

--drying facilities;

--possibly refrigeration facilities;

--possibly processing plants, including slaughterhouses;

--possibly fumigation and quarantine facilities;

--ports;

--rural electrification; and

--telephone system.

For the most part, Guam and American Samoa have the above mentioned facilities, although gaps and inadequacies do exist. The shortcomings are more serious for most of Micronesia. Funds needed to address these and other infrastructure shortcomings in Micronesia are to be made available as part of the agreement for ending the Trust Territory status.

Of special interest is the high priority given to airport development in the Marshall Islands. Seven airports have been built, and five or six more are planned. The current plan is to have every island served once a week, with freight being charged a subsidized fee of 20 cents per pound versus a real cost of 40 cents.

O. Farm Organizations

Farm organizations provide the advantages of scale economies, including

bulk buying of inputs, obtaining credit, marketing, etc. They also protect the interest of farmers through lobbying services.

It appears that cooperation should play a strong role, given the small number of farmers, the wide range of commodities consumed, the relatively small populations, and the small amount of land needed to produce the total demand for a commodity. However, it should be noted that cooperatives have had a poor record in developing countries. Common causes of failure include weak incentives for membership, unrealistically motivated welfare goals, and takeover of the cooperative by the elites who act in their own self-interest.

Another farming approach which has been attempted in a number of areas is collective, or group farming. These farms can be successful provided each member has a clear incentive to increase productivity, and the group is well managed. Also, those farms of the type found in Israel do make it possible for many people having little or no agricultural experience to learn farming techniques quickly and efficiently. However, collective farms generally have not met with success in developing countries.

For the Pacific islands under consideration, properly conceived and managed cooperatives would seem more contributory to their developmental objectives.

P. Land Tenure

Land tenure greatly influences which groups benefit from increased farm production and income, the type of technology used, social prestige, and the control of labor, wealth, and political power. In the case of large land holdings, the land is often underutilized, there is a tendency to favor machines over labor, and there is generally less employment.

Small commercial farms owned and operated by families who also live on the farms are often (but not always) preferable. The advantages of these farms are: a strong incentive to maximize income; output per acre is normally high; higher employment, higher standards of living, better diets, greater purchasing power for urban industry, and reduced rural dissatisfaction.

The clan system and communal ownership of land prevalent in American Samoa and most of Micronesia presents a particularly difficult problem to agricultural development. The system constraints incentives to work, makes profitability difficult to achieve because of pressures to share production before it is marketed, and may make it difficult to obtain use of the land for farming.

The best approach to overcome the restraints to agricultural development imposed by the clan system and communal ownership of land is far from clear. One approach which has been suggested is to focus on export commodities for which there is little domestic demand. This has the advantage that there will be little or no need to share the commodity with others; all or nearly all of the production reaches the market.

Another suggested approach for circumventing problems of the clan system and communal ownership of land is to rely on foreign (outside) management. Land would be leased by a private, or possibly a quasi-public, corporation which would pay a fixed fee plus possibly a percentage of the profits. This approach allows outside work values to be imposed on those who participate in the farming, including requirements for punctuality and restictions on sharing of production. Advantages of this approach are that islanders as a group would gain from rents and wages, and improve their competitiveness with foreign products. While off work, employees would be free to practice traditional values. Although this use of foreign managment and the imposition of alien work habits may be distasteful to some, it has been used successfully in running certain businesses in Micronesia. This approach, however, would be limited generally to the larger farm operations.

Q. Private Sector Involvement

Substantial private sector involvement is usually necessary for an economically healthy agricultural industry. The private sector contributes considerable expertise and resources; finances additional research, development, and extension services; has greater freedom to act; often has greater access to world markets; is often more efficient; and has strong incentives to succeed. Local businesses can serve small farmers at relatively low cost, bringing them inputs and buying their output, and can efficiently transport, store, process, and distribute farm products. Similarly, multinational firms offer access to resources which are critically short in developing countries, including advanced technology, valuable international contacts, management skills, and financing.

The critical roles of business and industry in agriculture are often poorly appreciated. Thus, the barriers to greater private sector involvement are attitudinal. There is an inclination by public officials and business people to see each others failings, instead of recognizing legitimate and potential

contributions. This has resulted in a chronic lack of confidence and cooperation between the public and private sectors.

These attitudinal problems have been observed to be particularly prevalent in Micronesia, especially in regard to foreign investment. As noted, policies restricting foreign investment in order to preserve island cultures also exclude beneficial investment, development, and introduction of practices needed to compete in regional and world markets.

R. Vertical Integration

Vertical integration occurs when a business handles all stages in the production process, including, for a farm business, the securing of needed inputs without going through local markets, relying on its own power and water systems, the actual growing of the agricultural product, transporting it to market, and marketing the product itself. In short, a minimum of labor and materials are controlled by others. Vertical integration of agricultural activities may contribute to increased efficiency, greater security and stability in the obtaining of inputs and the selling of their production, greater quality control, elimination of middlemen, and a reduction of overall production costs.

Given the inadequate development of both input and commodity markets for most of the islands being discussed, and the relatively small size of potential farm operations, some of the advantages of vertical integration may be attained through carefully structured cooperative arrangements.

IV. COMPONENTS OF AN AGRICULTURAL DEVELOPMENT PROGRAM

A. Introduction

This section contains a synthesis of guidelines for developing an accelerated agricultural development program. It follows upon the discussion in the first chapter of conditions and problems restricting agricultural development and requirements for an economically healthy agricultural sector. The previous sections have focused on the what and why; this concluding section will go into the who, when, and how. The various tasks necessary to carry out the program consitute an ambitious effort, particularly for a small island economy. They are mainly indicative, since most of the activities called for currently exist to a very limited extent, if at all. Nevertheless, the approach provides a model of an ideal program. In actual application to a small island economy, it is expected that many of the tasks will have to be scaled down as generally indicated.

B. Sustained Government Support

Successful agricultural development requires a substantial and prolonged government commitment--a commitment which must be maintained in the face of formidable obstacles. The difficulty derives from the enormous investment which may be required (such things as research, education, training, extension services, credit assistance, roads, water systems, storage and processing facilities, harbor facilities, airport facilities, rural electrification, etc.), and the fact that decades may pass before substantial returns are realized. However, over the long term, the returns should warrant the enormous investment and long delay, and the investment is often cheaper than other alternatives.

Political support may become inadequate for three possible reasons: (1) political leaders may not grasp the magnitude of the needed commitment and may become disillusioned when short-term accomplishments do not measure up to expectations, (2) the achievements during some years may lag behind those of previous years, and (3) there is a change in politcal leadership. Thus, the leaders must be kept well informed regarding activities, difficulties and accomplishments, and they must be reminded continually of the merits of the program. It is also important to keep the program from becoming too

closely identified with partisan political activities. One approach to improving the chances of long-term political support would be to develop strong local support by involving a broad constituency.

As mentioned earlier, the political support for agriculture appears weak for many (but not all) of the islands under discussion, largely because they now have other sources of overseas income. But the support is expected to increase, especially for the FSM, the Republic of Belau, and to a lesser extent, the Marshall Islands, as a consequence of an eventual reduction in Federal support programs.

C. Perspective

1. Objectives

The primary objectives of accelerated agricultural development are, in general, (1) to increase farm income through increased production, and (2) to increase employment of rural people.

The successful pursuit of these objectives increases the purchasing power to the rural population and provides them with other benefits. Additional objectives frequently included in agricultural development plans are:

--reduce reliance on imported food, thereby increasing self-sufficiency (the achievement of a high level of domestic food self-sufficiency is an important political and psychological goal for most countries),

--provide foreign exchange,

--diversify the economy,

--improve the income distribution,

--improve nutrition, and

--improve the quality of life.

These additional objectives are often achieved as a consequence of attaining the primary objectives.

The various development plans of the American-affiliated islands of the Pacific generally include equivalent versions of most of the primary and additional objectives listed above.

2. Target Groups

In general, an accelerated agricultural development program should focus on small farmers rather than large farmers. In most cases, this has the

greatest effect on increasing agricultural output and raising the incomes of the rural people who often have the major socioeconomic problems. Furthermore, efforts to increase the production of the small farmer will frequently serve all farmers, large and small, since technology improvements "filter up" and benefit large farmers far more rapidly than the reverse.

Other possible target groups are landless laborers and artisans in villages and towns.

Most plans for the subject islands lack a discussion of target groups; or limited beneficiaries.

D. Organization and Direction

1. Central Steering Committee

Direction and control of agricultural development should be provided by a central steering committee. This governing body should:

--include high-level representatives of agencies who are concerned with agricultural development, finance, planning, and commerce. In addition, there should be selected representation from the private sector, including non-agricultural industry;

--be permanent and be established to avoid frequent turnover;

--have the power to involve their agencies and implement programs (groups that are merely advisory seldom function well);

--receive funds for flexible support of activities involving interagency cooperation or activities otherwise not covered;

--receive progress reports and plans from program leaders; and

--have the power to approve major goals, strategies, work plans, personnel, and budgets for the activities it sponsors.

2. Commodity Task Forces

For each commodity targeted as a priority, a task force with technical expertise and comprising representatives of the major organizations should be organized and should meet frequently. Its function should be to:

--establish goals and devise strategies for accelerating output;

--determine how input supply, materials, marketing, and technical services should be improved;

--identify target regions for early attention;

--establish relations with scientific and other institutions in other countries from which information and materials for trial can be requested;

--insure smooth operations involving all relevant institutions and individuals; and

--provide continuity and coordination of efforts.

For most of the islands under discussion, it may make more sense to combine the above described Central Steering Committee and Commodity Task Forces into a single committee since the islands, agricultural industry, and government are all relatively small, and few commodities are likely to merit major emphasis at the outset.

E. Assessment of Resources, Problems, Opportunities and Projects

1. Assessment Perspective

In order to define an intelligent agricultural development strategy, relevant background information is obviously needed regarding the availability of resources, current problems with the agricultural industry, and opportunities for improvement. This information should be prepared and written with key policymakers in mind and should be prepared so as to give guidance on the type of agricultural activities worth pursuing (and not worth pursuing), and the level of effort. The key test for including the information is whether or not it will have any potential policy relevance.

Emphasis should be placed on:

--identifying those resources that are abundant and inexpensive, and those that are scarce and expensive;

--identifying factors which are restraining agricultural development;

--clarifying those problems which are solvable, and those which are not; and

--identifying opportunities which have been overlooked.

The material should reflect the judgment of all those who are involved with agricultural development--representatives of industry, farmers, government officials, bankers, researchers, educators, extension agents, etc.

However, the assessment and the subsequent plan development should be kept in perspective, and excessive time and effort should not be spent on it. Too often too much time is spent in the assessment and planning stages--"lack

of data" becomes an excuse for inaction. The task is to identify the minimum amount of information actually needed to make decisions, to determine how much of this information is already available, what more is needed, and how to get that information in the simplest way possible with a reasonable degree of accuracy.

2. Regional Assessment

Ideally, the information which should be covered in a regional (or single island) assessment covers the following:

(1) The natural environment.

--geographic location with respect to potential markets

--slopes and soil types by location and area

--climatic conditions (temperature, rainfall, and storms) by area and season

--potential surface and groundwater supply

(2) The cultural and social environment.

--local and visitor population size and distribution by age, geography, and race (relates to market size, labor supply, and food preferences)

--food preferences by group

--size and skills of labor force

--education levels

--land tenure

--family system (nuclear, clan, etc.)

(3) Economic and social environment.

--principal economic activities, including their export and total income and employment

--unemployment by number and type of worker, and availability for agriculture

--wage levels against which agriculture must compete

--price and income supports affecting agriculture (subsidies, price floors and ceilings, poverty programs, food stamps, etc.)

--credit availability to farmers

--energy market (source, availability, rates)

--taxes affecting agriculture

(4) Legal and political environment.

--trade incentives and restrictions

--price controls (see item 3)

--special interest lobbying groups affecting agriculture

--farm unions

(5) Infrastructure facilities and services (number, location, capacity, excess capacity, rates, etc.).

--transportation (roads, harbors, air service)

--agricultural storage and processing facilities

--electrical power

--communications (telephones, newspapers, radios, television, etc.)

--water system, including irrigation

(6) Overview of the agricultural industry.

--crop data (for each type of crop, acreage, average acreage per farm, number of farms, production, value, etc.)

--livestock data

--total and per capita consumption, exports, imports and local production of each major food

--farmer and farm data and trends (number of farms, farmers, subsistence farmers, and commercial farmers; average farmer age and education)

--discussion of typical farms, technologies, farmer aspirations, community organization and power structure, and formal and informal communications

--nutrient data (needs, problems, fertilizer imports and prices, use of manure, etc.)

--common pests and diseases

--agricultural education system (training facilities and services, extension services)

--agricultural research (facilities and activities)

(7) Commodity analysis (an analysis for each significant commodity).

--trends (acreage or number of livestock; number of farms, farmers, subsistence farmers, and commerical farmers; average farm size; yields; production; exports; imports; consumption; price; etc.)

--typical farm (type of plant, technology, etc.)

--cooperatives (buying, producing, processing, marketing, etc.)

--farm inputs (local supply or imported)

--processing and storage facilities

--markets (local and export, and arrangements)

--potential market (lesser of market or resource limits)

--factors restraining growth, and which are solvable

--general overview of needs to accelerate growth

(8) Promising agricultural activities (an analysis for each commodity).

--who identified them as promising

--history (prior attempts, by whom, where, when, reasons for failure, and do reasons still apply?)

--why promising?

--activities and resource needs to develop

(9) Official development policies and plans affecting agriculture.

--expenditures on agriculture

--activities targeted for promotion

--market development (import substitution, export)

(10) Agricultural policy implications.

--desired crop characteristics

--promising crops, which satisfy the characteristics

--factors restraining agricultural development

--problem analysis for each gap, problem or opportunity:

- is it solvable?
- will the solution result in significant growth?
- what are appropriate measures for solving the problems that have been overlooked?

(11) Potential for agricultural development and implications.

--potential for increased jobs and income assuming problems are solved and opportunities are achieved

--estimate of beneficial and adverse impacts (economic, social and environmental)

The above list represents an ambitious assessment. However, the task is correspondingly smaller for small economies such as those of the American

affiliated Pacific islands. Furthermore, much of the information for the subject islands exist and, in fact, has been assembled in various reports. An integrated agro-economic profile for Guam, American Samoa and the Trust Territory of the Pacific Islands, containing much of the above information has been prepared for the larger 406 report and can serve as an example. Information gaps are evident, but may be remedied.

3. Special Commodity Assessments

Special, detailed assessments should be also conducted for those few commodities targeted for potential priority. These assessments should cover, if possible, the following:

--10- to 20-year projections, by 5-year increments, of potential domestic and export market demand, by amount and monetary value;

--current area of production by season and region (for animals, include their numbers and information on pastures and other feed sources);

--nature and size of farm enterprises producing the commodity, by region, and which types of farmers produce what proportions for home consumption and for sale;

--prospects for expanding output using current technology on larger areas;

--marketing arrangements, including how farmers sell products, what proportions are sold to what kind of buyers, whether available purchasing points serve all farmers adequately, special requirements for quality grades, and weaknesses in the current system;

--nature and adequacy of input and credit supply systems, including the correct amounts of the correct inputs reaching all farmers when and where needed, and at reasonable costs;

--pricing system, including prices to farmer's, support prices, prices needed for profitable operations, and prices needed to intensify production;

--processing, including how, where in relationship to farmers and markets; and potentials for expanding or diversifying;

--transport and storage systems, including weaknesses in the system;

--current yields by region and season, including the highest yields under varying soil and climate conditions, average yields, and where

yields are low and static, potential yields based on similar conditions elsewhere;

--major technological and economic problems limiting productivity, potential market if overcome, availability of existing remedies, and major problems which will require continued or new research;

--availability of adequately trained personnel in various components of the system to be overcome, and responsible authorities;

--opportunities for greater cooperation among public and private organizations;

--connections with external centers of advanced technological work on the commodity, and need for new connections;

--external technical assistance received, and need for additional assistance; and

--actions which should be taken immediately, and what strategy should be pursued.

Again, the above list is ambitious, but the task is correspondingly smaller for small economies such as those of the American-affiliated Pacific islands.

4. Assessment Approaches

Common and complementary approaches for conducting the assessments described above include:

(1) Review of past studies and data which are immediately available and are supplemented by expert judgments.

The obvious first step in assembling an agricultural assessment is to build on information from past studies and on data which are immediately available, and are supplemented by judgments by qualified people and informed observers. Fortunately, a large portion of the information needed for an agricultural assessment of the subject islands already exists, and much of it has in fact been assembled.

(2) Task force

An approach for completing missing components of the needed assessments is to assemble a task force consisting of the most knowledgeable people in the agencies and in the private sector. The task force would then review

the system thoroughly in a series of meetings, and prepare situation papers.

(3) Workshops.

An approach similar to the above is to commission a series of papers on important aspects of the system for presentation at a workshop. This approach distributes the load among those agencies and individuals who are most capable of summarizing information on each topic. It also brings diverse people together to consider how the system might be improved with each participant gaining a better understanding of the total system and the importance of the function of his particular agency. A situation paper could then be prepared from information assembled from the separate studies, after evaluation at the workshop.

(4) Sample surveys.

Sample surveys which are designed to develop information on a specific subject--such as income of subsistence farmers--may be justified. However, comprehensive sample surveys for small economies should be avoided because of the expense and time involved in conducting them.

(5) Aerial photographs.

Aerial photography may be useful for larger areas where it would be valuable to conduct rapid assessments or to update existing ones.

(6) Reconnaissance surveys and interviews.

A reconnaissance survey is useful for gaining in-depth information quickly about farming systems. Such a survey would entail intensive site visits by teams of two to five members. The visit, which would last from a few weeks to at most a few months, would focus on key issues, growing regions, and practices. The objective would be to understand what the farmers are doing, why they are doing it that way (how they have adjusted historically to their agro-socioeconomic conditions) and what is required in any new technology (proposed change) if it is to be accepted on a large scale. The team should be multidisciplinary, and should include social scientists (anthropologists, sociologists, economists, and agricultural economists) paired with biological scientists (plant and animal technicians in such areas as entomology, breeding, pathology, physiology). An anthropologist may be of particular value in helping to assess subsistence farming activities. Interviewing

partners should change daily in order to reduce interviewer bias and increase cross-disciplinary interchange. The group should meet daily to discuss findings and preliminary interpretations, and modify the questionnaires that are used.

It is desirable for the reconnaissance survey to be conducted during periods when the farmer has spare time, and should avoid such peak-work periods as harvest time. The depth of interview rather than number of interviews should be stressed. The purpose of these interviews is not to obtain benchmark information but rather to identify factors and problems important in generating or adapting technology.

For defined-area agricultural campaigns where even the smallest farmer may grow many crops and raise several types of livestock, total farming systems--not merely their commodity components--must be examined. The goals of the farmer and his family must be considered as significant as the physical and biological limitations of the land.

(7) Farm records.

The reconnaissance survey is based on recall and is not sufficiently accurate for use in economic analyses of farm trial data. For this reason, a dozen or so cooperating farmers in each agricultural zone should be selected to initiate farm records. These records are simple forms on which the farmer notes daily the work he has done on each crop, in which area, with which contracted and family labor, and the inputs which were used. Other information such as planting distances, populations, varieties, etc., can be obtained in discussions during the frequent visits made by extension personnel.

(8) Feasibility studies.

Feasibility studies in response to specific programs may be needed. These should be done rapidly so as to improve the quality and timeliness of important decisions; attempts to achieve precision through lengthy studies should be avoided.

(9) Annual update.

The assessments should be updated annually, with an in-depth update occurring approximately every third or fourth year.

F. The Agricultural Development Plan and Program

In order to accelerate agricultural development, an action plan is

generally desirable. It can serve as a means of developing a concensus for a consistent, affordable, and achievable strategy that will provide a means to coordinate the actions of diverse groups. It can also identify key linkages between agriculture and other sectors--industry, commerce, services, infrastructure--and indicate actions required to strengthen complementary relationships. Most of the American-affiliated Pacific islands now possess or will soon complete agricultural plans. However, these plans are generally weak in some key areas.

The fuller report submitted to USDA contains an overall review and critique of many of these plans, and discusses the experience, status, and issues of agricultural development planning in the State of Hawaii.

TO ASSIST IN DEVELOPING ISLAND PLANS FURTHER, AS WELL AS TO GUARANTEE THEIR IMPLEMENTATION, UH CTAHR-SPONSORED WORKSHOPS ON "STRATEGIES FOR ACCELERATED AGRICULTURAL DEVELOPMENT" MAY BE ADVISABLE. THE WORKSHOP WOULD BE DESIGNED FOR HIGH-LEVEL GOVERNMENT OFFICIALS AND MAY INCLUDE AGRICULTURAL SECTOR REPRESENTATIVES.

1. Long-term goals

Long-term (perhaps 10 years) goals for agricultural and rural development should be established for each major commodity, target group, and region which will be the focus of development. Ideally, the goals should have the following characteristics:

--respond to what is desired as well as to what can be done, with local participants playing an active role in establishing goals and priorities;

--goals should be as few in number and as simple in focus as feasible;

--goals should be specific and quantifiable, if possible, or at least capable of being evaluated objectively; and

--steps toward achieving the goals--what is to be done, by when and whom--should be indicated.

The stated goals should be accompanied by the assumptions on which they are based. They should also be reviewed periodically.

Clearly defined objectives provide a standard against which progress (the magnitude or direction of change) can be measured and against which responsibility for success or failure can be assigned. Vague goals permit

unconditional declarations of good intentions without committing anyone to anything in particular, thereby losing significance in project formulation.

The long-term goals should provide a guide to shorter-term action, reveal the magnitude of gains required and the speed of action necessary and, in turn, affect the choice of strategies, the involvement of various public and private organizations, and the size, nature, and sequence of investments required.

2. Plan Content

The agricultural plan should address:

--what and how much is to be done for each farming district, based on priorities to remove factors limiting agricultural development, and conditioned on available resources;

--who is to do it (i.e., what level of government, what agencies);

--how is it to be done;

--over what time period;

--how progress is to be measured.

3. Focus on Key Commodities, Activities, and Areas

In order to maximize results, the plan and implementing effort should focus on a few commodities, activities, and/or areas which have the greatest potential of raising productivity, income and employment.

A strong commodity focus on key local foods and selected exports is generally (but not always) more successful than an area, or institutional, focus. However, a defined-area campaign is an appropriate strategy for addressing the needs of small, near-subsistence farmers. Such farmers generally use intricate farming systems and many have pushed productivity to the limits for the conditions under which they operate. For them, farming systems can be improved only in minor ways unless the limits themselves are raised by improvements in infrastructure, markets and credit services, and/or productivity is raised through appropriate research and innovation.

For defined-area campaigns, the geographic scope should be such that:

--the area is substantial so that the undertaking is economically and politically significant;

--the area is reasonably physically and economically homogeneous;

--the area is located within a single administrative or political

district so that political support from all levels can be obtained and so that it fits the geographic responsibilities of existing agencies;

--needed services are conveniently available to farmers through a number of centrally located service centers which provide markets for farm products, farm inputs, credit, and services of extension agents (with each service center typically covering an area within about 5 miles from the center), and with the individual service centers themselves supported by wholesalers, credit facilities, etc.;

--the soil, climate, and accessibility of the area permit progress;

--the technology required to increase yields of target commodities is available or it is possible to develop quickly;

--needed climatic and other data are available; and

--land tenure and other cultural and social conditions and practices allow working with small farmers and permit improvements in farming systems.

For the islands under discussion, the natural area on which to focus would be in most cases a single large island, or a collection of smaller outer islands.

If a number of different types of ecological areas promise significant agricultural potential, then at least one area of each type should be selected promptly as an area of focus. However, shortages of resources may limit initial efforts to just one or a few regions, such as those areas which are most favored with the needed resources and an expensive infrastructure already in place.

4. Emphasis on Steady, Incremental Advancement on Numerous Problems

In general, the most successful approach is an incremental one consisting of a series of many simple and complementary projects and improvements whose selection and design is influenced by feedback from farmers and others. In contrast, a grandiose, comprehensive and complicated package of integrated projects designed to accomplish a one-time major change is prone to failure. Common reasons for this are: the excessive number of immediate tasks may lead to inaction and/or dissipation of effort; the plan may easily go off schedule, collapsing because of delay or failure in one part of it; administrative requirements may be beyond the capabilities of the developing

country, and demand and supply factors may be out of balance.

Similarly, an approach which involves focusing on only one or two missing elements is also prone to failure. This approach works only if all other elements are already in place (which is seldom the case), or if when the missing element is inserted, it acts as a catalyst for the development of other elements.

5. Leverage of Outside Authorities

In some cases, local scientists or administrators find it difficult to win the support of their own political authorities for worthwhile proposals, while outsiders often can, even if they are no more competent. The leverage of outside authorities, who can be invited to review local prospects and report to local authorities, should be considered. Personnel belonging to international organizations or private foundations can help legitimatize the views of local staff and otherwise help bring opportunities to the attention of local authorities, sometimes offering to finance a portion of the efforts. THE FSM HAS INDICATED A DESIRE TO HAVE THE UH CTAHR TAKE ON THE RESPONSIBILITY FOR SUCH A ROLE FOR THE RESEARCH AREA. Care should be taken so that such outside assistance would not be regarded as overly interventionist nor paternalistic.

6. Project Evaluation and Selection

a. Criteria for project selection.

Although well-conceived agricultural development plans are important, well-planned individual projects are of greater importance. The priority-setting process utilized in Hawaii has been described and analyzed in Chapters III and IV. While to a large extent the process may not be replicable in the other Pacific islands, some of its basic socio-economic considerations may be applicable.

In general, projects which should be favored are those which:

--contribute to the agricultural development plan and complement other projects;

--represent a point of view for which farmers have expressed a need, because it contributes to their profits (but does not necessarily maximize their yield);

--gives immediate (less than 5 years) growth potential, or at least moderate-term growth potential (5 to 10 years);

--the benefits are reasonably fair, with maximum cost recovery from major beneficiaries.

--the sponsor or agency which is responsible for carrying out the project is qualified; and

--the feasibility of the project is demonstrated before large-scale application occurs.

b. Appropriate accounting for costs and benefits.

When evaluating projects, all related costs and benefits should be included. For example, evaluation of an irrigation project designed to increase yields should include the cost of all other inputs that will be required to increase the yields. Similarly, the indirect benefits of a successful experience (increased willingness to innovate, transfer of knowledge to other farmers, increased service employment, improved diets, etc.) should be included wherever feasible.

This consideration would also apply to projects such as roads, which provide a wide spectrum of benefits beyond just agriculture (increased mobility and increased access to health services, schools, stores, entertainment, etc.).

Proper accounting of relevant costs and benefits is necessary and instructive. But over-reliance on it can take the very important, if not essential, element of vision out of the development process. This can cause investment to flow to narrow, short-term projects in which costs and benefits can be calculated reasonably, rather than to more flexible, sustained, and comprehensive programs for which benefits might be large and extensive, but which are quantitatively unmeasurable. The planning process will need to strike a careful balance between accountability and innovation.

7. Flexiblity

a. In approach.

Commodity systems and regions are so diverse among the islands that a variety of approaches to strengthen them can be expected. For basic food crops, which are produced over wide areas by many small farmers, a region-wide, publicly financed effort involving many agencies, with open political support, will usually be needed.

It may be appropriate to use a narrower approach with export crops. Production is generally concentrated in a few localities, and work on the

crop is often financed with a levy. Often only a few business-oriented groups are involved with the commodity. Research and training are usually centered at institutions that operate under a management board which is concerned with the overall success of the entire system.

b. Over time.

Development of any region will be a continuous and long-term process. All efforts should be organized to permit continuity of work and possibilities for innovation over a prolonged period. However, flexibility of action--basing plans for each year on the progress of the previous year--is advisable.

c. Procedures.

It is often essential to introduce a great deal of flexibility into procedures by utilizing an adequate number of high quality staff, decentralizing the organization, having an adequate budget not overburdened with reporting requirements, and an accurate monitoring system which provides quick feedback at relatively low cost.

8. Adequate and Flexible Financial Support

An adequate and sustained budget should be provided, which covers both recurrent and capital expenses, is easy to administer, allows flexibility, and provides adequate pay to maintain morale. The budget should be sufficient, with costs kept at levels which allow selected duplication of activities in more than one area. Furthermore, financing should be assured far enough into the future so that a reasonable amount of time is available for achieving the desired goals. A "rolling planning" procedure, where expenditure plans are programmed several years in advance but which are revised annually, provides a sound but flexible approach.

9. Administration

As a general rule, it is preferable to establish administrative procedures which are compatible with existing government systems. If the agricultural program is protected too much from bureaucratic methods through special arrangements, replication of promising projects will be hampered. However, as mentioned above, it is often essential to introduce a great deal of flexibility into existing procedures.

10. Measurement of Progress

In order to provide a means of comparing different production systems, part of the agricultural program should allow for measurement of progress

towards goals. The measures should be relatively easy to quantify and reflect quality differences; in short, they should make sense to the farmer for whom the system is designed. Appropriate measures include:

--the number of farmers who adopt a new production system;

--increased productivity, measured in terms of the total baskets of production, and in terms of the resources which most limit the capability of the farmer to increase his income; and

--increased income, including non-cash renuneration.

Addition guidelines for evaluation measures may be found in the Chapter IV discussion of research resource allocation in Hawaii.

When farmers reject a recommended practice, attempts should be made to determine their reasons in order to guide future plans.

11. Annual Workshops and Evaluations to Update the Plan

Annual workshops lasting several days allow all those who are directly and indirectly involved in the agricultural program to examine the past year's progress, adjust goals, and establish plans for the ensuing year. All major agencies, industry groups, and producer organizations should be invited. Also, political leaders should be asked to participate to underscore the importance of cooperation of all concerned, and indicate political support at the highest levels. Evaluations of progress on achievement, problems, and new opportunities should be provided to workshop participants. These should include evaluations by outsiders who offer independent judgments and added leverage to support necessary improvements.

G. Improvement, Coordination and Synchronization of Agency Services and Infrastructure Development

Agencies and others must cooperate and work together at all levels in order to improve agricultural services and develop the necessary infrastructure. Furthermore, improvements and developments must be coordinated and timed properly as called for in the agricultural development plan.

In order to improve agricultural services, agencies should be reorganized to (1) orient them toward more rapid agricultural development, (2) provide for integration into the planning process, and (3) streamline operations. Rather than relying on outside services or the establishment

of new institutions, it is advisable, in most cases, to strengthen local institutions. The most effective way to improve agencies and other institutions is to involve them in a purposeful, fast-moving development effort.

As stressed throughout this document, cooperation among organizations and among individuals is essential. This can be encouraged by:

--having field stations, production centers, schools of agriculture, and farms participate in field trials and demonstrations;

--having producer groups arrange for farmers to participate in tests and demonstrations, promote local interest in agriculture, and identify and develop solutions for logistical problems;

--having faculty members undertake part-time research to improve or promote farming techniques;

--include personnel from public and private organizations in training sessions;

--using the local media to transmit timely information to rural people and to keep the public informed of activities; and

--asking who can help and in what ways.

H. Training and Education

As discussed earlier, if agriculture is to develop in most of the subject islands, agricultural training must be strengthened considerably. In order to be successful, the training program should be designed to produce a stream of individuals who are trained to help farmers help themselves. The training should ensure that each farmer has the opportunity and motivation to learn:

--the basic farming skills that are necessary to be competent and confident when working with farmers;

--specialized knowledge to make him effective;

--competence as a manager;

--the importance of his activities within the overall development strategy;

--a sense of urgency in developing skills and implementing programs; and

--a strategy view of agricultural development, rather than a narrow specialty.

To help accomplish this, agricultural education institutions of all types, from lower education through college and beyond, should be involved in the

development program--thereby making their programs more relevant.

At the same time, all agencies involved in agriculture should engage in training through a 1- to 2-year internship program. Agricultural development, programs should be operated in large part by young people in training who work under relatively few senior specialists, and who become increasingly responsible for important components. This will allow continuation and expansion of the training activities and extension into actual farm operations. Emphasis should be on basic skills in agronomic and animal experimentation, communication, evaluation, and management.

Normally, the initiation of an in-service training program must be restricted to just a few regions--often only one--which can be staffed adequately by existing trained and experienced technicians. Each is assigned one or more interns who learn on the job as they contribute to development efforts. Even though many of the participants may be quite young, they should be treated as staff members rather than as students, and their responsibilities should be increased as rapidly as circumstances permit. Concurrently, some people from the organization should be selected for advanced training at academic institutions.

Beginning even in the second year, new regions can be added to the program by elevating some of the staff who demonstrate capabilities.

INVOLVEMENT OF THE UH CTAHR IN EDUCATION AND TRAINING PROGRAMS MAY BE COUPLED WITH SUPPORT FOR NEEDED RESEARCH.

I. Research

For American Samoa and Micronesia, the research approach described below would have to be scaled down to reflect the small size of those two local economies. They obviously should focus on research which is critical to their special local problems. However, this should be supplemented by taking full advantage of the research being done at the international agricultural research centers, and by drawing on the basic research being done in developed nations,especially the UH CTAHR. In addition, expansion of the Agricultural Experiment Station at the University of Guam provides opportunity not only for fruitful research on Guamanian problems, but for supportive analysis of issues stemming from the other territories.

1. Functions

An effective research system serves at least six major functions:

--identifying opportunities for advances in agricultural productivity and profitability, estimating their potential, and making the results available to responsible authorities in understandable terms.

--participating with planning specialists in the development of ambitious, yet realistic, agricultural goals, strategies, and tactics;

--developing and testing components for improved practices, with emphasis on problems which require immediate attention, or on ones which will contribute significantly to progress;

--combining components into profitable, high-yield farming systems for each locality, with research being carried out at regional stations and in farmers' fields (thus also contributing to extension services);

--identifying and publicizing improvements in supply services (extension, input supply, credit, marketing, price policy, etc.) that will advance agriculture and the well-being of rural people substantially; and

--training staff for teaching, research, extension, and administration.

2. Characteristics of Effective Research

Characteristics of effective research are:

(1) Orientation.

--clear, ambitious, and flexible research priorities;

--early initiation and timely implementation of agreed-upon projects;

--emphasize yield per unit of time, not simply yield;

--use maximum yields as a means of stimulating better research efforts;

--orient the research to small farmers;

--be clear in explanation of possible gaps between laboratory experiments and field results;

--research should transcend single commodities or regions that are organized on a problem basis;

(2) Staff

--include individuals oriented toward economic development planning and programming;

--develop well-trained research authorities for each important commodity or problem area;

--assign scientists to regional (tactical) stations or farm-level operations;

--research should be conducted by multidisciplinary teams who focus on particular commodities, areas, or problems with special attention to communication between biological and physical scientists and the social science disciplines;

--retain competent and stable leadership by offering competitive salaries;

--allow specialists to remain in their specialties and arrange for them to have overseas interactions in order to maintain skills and contacts;

--seek out research that provides staff development through on-the-job training;

(3) Linkages

--research should be linked to the development process and the other key economic sectors of the nation;

--research should aim for a continuous flow of information among farmers, extension services, schools of agriculture, planning and other agencies, and the private sector;

--research should be linked with international research centers so that their findings and resources can be drawn upon;

(4) Facilities and equipment.

--facilities should be of high quality with adequate equipment;

(5) Reporting

--the reporting system should be designed to accommodate politicians, planners, bureaucrats, farmers, and technicians and should be in understandable, non-technical language;

--research results should be written clearly and reported promptly;

--the reporting system should not interfere with scientific productivity by imposing heavy bureaucratic procedures on the research process.

3. Research Priorities

Research priorities should be basically supportive of the agricultural development program. A balance must be reached between the extremes

of carrying out (1) research that is directed exclusively at problems of high priority and (2) research by scientists in whatever areas they choose. The discussion in the fuller report is of a similar issue which has arisen in connection with the University of Hawaii's Section 406 Tropical Food and Agricultural Research Program and which may prove illuminating.

A development of research priorities generally includes the following steps:

--specify national or regional goals;

--specify the scientists' objectives;

--indicate changes in the existing system which will be necessary to meet targets;

--specify the problems which will have to be solved to effect the changes;

--identify alternative approaches to solve the problems;

--evaluate alternative goals (time requirements for the research; adoption, urgency, availability of similar research; costs, risks, contribution to goals; general importance and potential for contribtuion to knowledge, etc.);

4. Involvement of Local People and On-Farm Experiments

Priorities for experimentation should begin with an understanding of the technologies and practices being used in a given area, an understanding of why farmers use them, and a listing of customs likely to influence the availability of labor. This information should be provided by small farmers and community leaders.

Following this, consideration should be given to what modifications can be made to existing technologies and practices in order to improve output and incomes; small farmers and community leaders should contribute to the evaluation. For areas which are similar, the modifications might be based on technologies which are in successful use elsewhere.

5. Principles of Organization

Organizational principles which contribute to successful research include:

--an organization which is designed to stress the "Characteristics of Effective Research" as described above;

--policies which are guided by a board having representation from the diverse interests of government, the private sector, and scientists;

--a degree of autonomy for researchers from regular government rules and regulations; and

--funding for the research projects which reflect priorities of the agricultural development plan.

6. RELATIONSHIP BETWEEN THE AMERICAN AFFILIATED PACIFIC ISLANDS AND THE UNIVERSITY OF HAWAII, COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES

For those governments (presumably the FSM, the Republic of Belau, and possibly others) which desire continuing supplemental research from the UH CTAHR, a formal arrangement would appear to be desirable in order that the proper input and support will be received by Hawaii and sufficient priority placed on the research by the university. In developing this arrangement, care must be taken to design an effective working relationship that overcomes the vast distances separating the subject islands from Hawaii. Although the exact arrangements must be negotiated, the following elements and relationships might be included:

(1) Organization to represent the American-affiliated Pacific islands.

In order to develop research priorities coordinated among the participating islands, and thereby increase the priority of the desired research within the UH CTAHR, a coordinating organization would be desirable. Although such an organization can be organized and administred within the UH CTAHR, it may be preferable and economical to use the already existing Pacific Basin Development Council (PBDC) since this organization has the proper economic development focus, has established relationships with a number of the subject governments, and avoids problems of divided loyalty (the PBDC would clearly represent the interests of the sponsoring islands, and not both the islands and the UH CTAHR). However, the membership of the PBDC would have to be expanded to include the FSM, the Republic of Belau, and the Marshall Islands if they wish to join, or other arrangements may be necessary to achieve the desired coordination. Functions of the organization would be to:

--work with the individual governments, including their agricultural staffs, and the UH CTAHR in devising research priorities;

--lobby for a high priority for the desired research;

--assist in disseminating all available and relevant information on research capabilities, activities, and results to the sponsoring islands; and

--assist in arranging training programs which may be needed.

(2) University of Hawaii, College of Tropical Agriculture and Human Resources

RESEARCHERS OR ADMINISTRATORS WITHIN THE UH CTAHR SHOULD BE ASSIGNED THE RESPONSIBILITY FOR FOCUSING ON THE AMERICAN-AFFILIATED PACIFIC ISLANDS. Responsibilites would include:

--working with the organization discussed above, the agricultural representatives of the individual governments, and on-site interns (if any) to assist in developing research priorities for the subject islands;

--representing the research needs of the subject islands in UH CTAHR negotiations regarding the allocation of Federal funds provided for tropical research;

--identifying existing or contemplated UH CTAHR research projects or programs with relevance to these islands and working with researchers involved to see how their efforts or results might contribute to the developmental objectives outlined throughout this report;

--arrange any necessary training programs; and

--assist, in conjunction with the above mentioned organization, in disseminating information to the subject islands on relevant research activities and results.

Depending on funding, it may also be worthwhile for the UH CTAHR to sponsor a UH INTERN PROGRAM, AND POSSIBLY EVEN UH-DESIGNATED FIELD STATIONS LOCATED IN MICRONESIA. The UH CTAHR would be responsible for assigning the interns, monitoring them, and preparing monthly reports, but daily supervision would be the responsibility of agricultural officials in the host country. If desired, selected reports would be published by the UH CTAHR in order to support developmental recommendations. Advantages of such an intern program include contributions to immediate farm-level research, possible added prestige to research results, training for both the interns and co-workers, and information which would be valuable in setting UH CTAHR research priorities.

In providing the supporting research, it will be important for the various parties to understand the perspective of the UH CTAHR with regard

to establishing research priorities. Namely,

--the amount of discretionary funding available for additional research is limited;

--there will be many competing research proposals;

--it will be necessary to satisfy the needs of the State of Hawaii unless the funds are clearly committted to non-Hawaii projects;

--it will be necessary to maintain expertise in key areas, with support given to those prominent researchers who have the ability to attract additional and continuing research support;

--the proposed research must be urgent and constitute a meaningful contribution to developmental objectives; and

--the country or areas sponsoring the research must be judged to have effective agricultural development plans which are being implemented; and/or

--the results of the research must also be applicable elsewhere.

In addition to research support, the UH CTAHR may also participate in developing and providing agricultural education and training.

(3) Role of other Pacific island educational institutions.

There are some possibilities for research assistance from educational institutions located in the other Pacific islands. Because these institutions are new or still in their formative stages, such assistance may be extremely limited or restricted to narrow areas in the near-term. The best potential lies perhaps in initiation of modest cooperative arrangements between the University of Hawaii and the other institutions where mutual advantages are readily perceived.

For example, UH CTAHR is already involved under an AID grant in planning for an agricultural component of the University of the South Pacific, to be located in Western Samoa. Although international jurisdiction is involved, conceivably, arrangements could be made for supportive research and training for American Samoa and other Pacific island areas.

Possibilities for useful collaboration with Guam may be more immediate. The College of Agriculture and Life Sciences (CALS) of the University of Guam provides undergraduate education and administers the Guam Cooperative Extension Service and Agricultural Experiment Station programs, which are supported by the U.S.D.A. Given the present small scale of agriculture in

Guam and the small population base, a full-scale agricultural research program probably cannot be justified. However, a cooperative working relationship between UH CTAHR and UOG CALS, supported by the U.S.D.A., could be beneficial.

UH CTAHR could provide support in terms of the more basic type of research, calling upon its wider range of expertise and facilities. Likewise, in some areas of applied research, laboratory facilities, specialized equipment and selected technical skills could be utilized in support of projects in which both Guam and Hawaii researchers participated and field work is carried out in Guam. Also, an interchange of faculty and researchers on a regular basis would benefit the educational and research functions in both Guam and Hawaii, and may enable at least a modest level of graduate level training to be offered at UOG CALS. Some of these advantages could also be extended to the Northern Mariana Islands and other island groups.

(4) Funding.

The major portion of the required funding should come from the participating governments themselves, (although Federal funds allocated to an individual government may be used, of course). There are two reasons for this. First, funding by the participating governments should insure their commitment to the program and their interest in obtaining and using the research results. Second, the funding should insure responsiveness from the UH CTAHR; if, over the long-term sufficient benefits are not forthcoming, funding will likely be withdrawn.

J. Extension

1. Functions

Functions of the extension service include:

--providing information to farmers;

--training the farmer and others in new practices;

--helping the farmer overcome bottlenecks (supplies, credit, marketing, etc.); and

--working closely with scientists and farmers to continually and systematically upgrade the technical basis for the most promising crops, animals, and farming systems through on-farm trials.

Local farmers must be made to understand that they are part of a program to benefit themselves, not merely subjects of an experiment that may benefit others. Otherwise, it will be difficult to obtain the needed information from farmers, and the farmers will resist introducing improved practices.

2. Needed skills of the extension agent

The extension agent should be competent and confident in at least four areas:

--technical competence in understanding agricultural sciences, conducting field experiments, diagnosing common problems, and prescribing proper solutions;

--economic competence in estimating the profitability of various practices;

--farming or on-farm competence, and

--communications competence, particularly with poorly educated (but intelligent) farmers.

3. Paying the extension agent

If part of the extension agents' salaries are paid from local sources, the agent will have a vested interest in providing good service to local farmers; also, the farmers can feel justified in demanding high-level service in return for their tax payments.

4. Team approach and members

The mandate of working with local farmers and organizations to carry out the agricultural development program is best given to a team of dedicated, well-trained, skilled, and confident individuals. Team members should be, if possible, of local origin and fluent in the language of the area. Also, members should be provided by the organizations responsible for agricultural development. Continuity of senior technical personnel in the early period will contribute to establishing trust.

Field extension workers should be brought together every few weeks for in-service training, meetings with specialists and scientists as needed, staff meetings, and administration. The optimum size of each such operating group of field workers--about two or three dozen--is the number that can most effectively be handled as a group in in-service training.

5. Identifying and developing future leaders

A means of identifying and preparing future leaders must be developed so that vacancies can be filled with competent individuals. Candidates should:

--be well trained in the required technology;

--have the proven ability to lead;

--be dedicated;

--be capable of taking advantage of contacts with national and international agricultural centers.

Efforts must be made to develop and retain such individuals in their specializations. They should be supported financially and administratively, and should be encouraged to keep in touch with advances elsewhere by visiting other programs and attending important international meetings.

6. Zones of action

In programs involving large areas, the area should be divided into zones, with one or more technicians being given primary responsibility for work in each area. Criteria for establishing zones may include climate, soil, social and political organizations, and degree of mobility. Also, an agent should be able to reach the most remote village in his area in about an hour. For small Pacific islands, however, the obvious choice for a zone of action in many cases will be a single island.

7. Channels of Communication

An important consideration will be the ability to transmit information among farmers, agricultural leaders, agricultural institutions, businesses, and government leaders. Channels of communication include:

--person-to-person contacts, preferably involving technical agents who are of local origin and are fluent in the language of the area;

--field demonstrations of new practices;

--cooperating farmers, who then provide farmer-to-farmer communication;

--use of community leaders and the socially powerful (if only as advisors so they will not feel left out, later blocking progress);

--women leaders for direct communication with women agriculturalists;

--possible use of religious leaders or even midwives to aid communications; and

--use of radio, television, pamphlets, tape recorders, and village meetings largely for the purpose of creating a favorable climate for change.

--use of the communications satellite network headquartered at the University of Hawaii (PEACE/SAT) for two-way or conference-type

discussion of technical or scientific issues.

K. Other Improvements to the Agricultural Industry

1. Farm Organizations

The formation of farm organizations should be encouraged in order to obtain the advantages of scale economies, including bulk buying of inputs, obtaining credit, marketing, etc. Lobbying groups are also needed to protect the intersts of farmers.

In order to be effective, a group must be formed to achieve objectives about which the members feel strongly--sufficiently so to make sacrifices to achieve desired changes. Furthermore, the natural leaders among the small farmers must be permitted to emerge in the leadership roles of the groups. The role of women in the development process has been stressed.

2. Private Sector Involvement

An important component of agricultural development which is largely missing for most of the subject islands is involvement of the private sector. As mentioned previously, a major reason for this is attitudinal; there is a tendency for both public officials and the businessmen to see one anothers' failings instead of recognizing their legitimate and potential contributions; this results in a chronic lack of confidence and cooperation between the two groups. The most reliable way to overcome attitudinal barriers is to bring the alienated parties together so that each can see how much they have in common. This can be accomplished by:

--launching joint public/private projects, particularly for risky ventures;

--having the government contract with the private sector for farm services that are lacking;

--having government financing organizations buy shares in the private corporations;

--exchanging shares to increase the number of companies that have both public and private representation on their boards of directors; and

--organizing management seminars in which decision makers from both sectors discuss cases and participate in management, organizational and psychological exercises.

3. Aid from Overseas

In general, aid from overseas will be necessary in order to accelerate

agricultural development. However, not all aid is beneficial. For example, food provided free or well-below cost--such as that provided under U.S.D.A. food distribution programs--destroys the farmer's incentive to produce. Also, funds which must be spent on imported high-technology may end up being wasted. Instead of providing large quantities of free or below-cost food, TECHNICAL AND RELATED FINANCIAL ASSISTANCE WOULD BE PREFERABLE. Food should be provided only in cases of natural disasters or emergencies.

To help finance technical assistance (as well as other portions of the agricultural development program), funding for technical assistance might be coupled with food imports. The U.S.D.A. COULD MATCH FOOD DISTRIBUTIONS WITH GRANTS FOR TECHNICAL ASSISTANCE, or the individual government could impose a fairly modest tax on food imports. Thus as food requirements rise, agricultural technical assistance would rise in step.

IN ORDER TO COORDINATE AGRICULTURAL ASSISTANCE TO THE AMERICAN-AFFILIATED PACIFIC ISLANDS, IT MAY BE ADVISABLE TO CREATE A SPECIAL PACIFIC DESK OR OTHERWISE INCREASE THEIR VISIBILITY WITHIN U.S.D.A., PARTICULARLY SINCE IT APPEARS LIKELY THAT AN INCREASE IN U.S.D.A. ACTIVITY IN THE PACIFIC MUST OCCUR IN RESPONSE TO PROVISIONS OF NEW LEGISLATION AFFECTING THESE ISLAND (P.L. 96-597).

L. Specific Considerations for Pacific Island Development

The preceding section has put forth some general approaches toward increasing productivity and growth in agriculture and enlarging its role in the Territorial economies. As has been suggested, each of these island groups is at a different stage of development so that the presentation should not be equally applicable in each case. The Territory of Guam has the largest population among the groups, the closest western contact, and probably the broadest base for an accelerated agricultural development. Thus, the approaches outlined may be considered largely applicable to the Guamanian situation and to a more limited extent and with a greater time large to the Trust Territories and American Samoa. The following commentary will be supplementary for Guam and in somewhat fuller detail for the other islands.

1. Guam

a. Market Expansion.

Although the domestic Guam market for agricultural produce is inherently

small, there are a number of indications it can be significantly expanded. For one thing, the food stamp program is quite large in Guam, but since most food is imported, its impact on local farmers is probably minimal. Adjustments to the program to ensure that a minimum proportion (25% as in the Northern Marianas) of the value of food stamp purchases is spent on locally produced food probably would be of significant benefit to local agriculture. Increased local procurement for the school lunch program has been suggested as another possibility.

Secondly, the military bases in Guam import large quantities of food from the mainland for use in the messes and for distribution to military dependents through the base commissaries. Efforts have been made to seek larger contract sales from local suppliers; although amounts purchased are still small. Greater joint initiative on the part of USDA and the Department of Defense, working in cooperation with the local government, should result in an increased proportion of total military food requirements being met by Guam farmers.

Thirdly, a growing tourism sector provides additional opportunities for market expansion. Further, the proposed construction of a new public market facility can encourage increased domestic consumption, while establishment of a fumigation plant can lead to export sales, particularly to Japan.

Fruits, vegetables, eggs, and pork are presently produced in sufficiently large quantities in Guam to indicate that supply would probably be responsive to the increased demand. Whether supply can meet the new demand fully and expeditiously is contingent on resolution of several key resource issues.

b. Resource Issues

Availability of agricultural land appears to be a resolvable issue. The pattern and direction of urban growth, location of military bases, and ecological concerns have pointed to the southern region of Guam as the primary area for agricultural expansion. Projected urban water demand, as well as the need to develop distinct, less costly water systems for agricultural use, also indicate that the surface waters in southern Guam must be tapped. A soil survey completed in 1978 confirmed that nearly 7,000 acres of lands designated by the official planning agency for agricultural use were indeed suitable for such use. However, a large portion of these lands, particularly in the South, can be made available for agricultural development only if access roads, clearing, and other improvements are made. These improvements,

together with the development of new water systems, will involve a substantial investment of public funds. These costs will need to be estimated and the means devised for meeting them, once the scale, substance, and pace of the contemplated development is determined.

In addition, more lands can be made available through changes in public policy. In Guam, a low effective property tax has resulted in potentially usable lands being held idle. A revised differential assessment system with more favorable rates for the more productive lands would provide incentive for agricultural enterprise. A revision of the government land-leasing program toward longer-term, larger parcel leases should have similar effects.

The other major resource issue concerns the availability of labor. Unlike most of the developing countries of the tropics, in Guam, there is no large rural population from which to draw in the event of a large scale expansion in agricultural activity. Raising labor productivity among existing farm operators will be prerequisite to increasing production and initiating sustained growth. To date, there has been little demand for outside farm labor, given the small size of farms and low commercial returns. Should the scale or pace of development be increased, this demand should also increase concomitantly. In anticipation, a broad-gauged approach will be required, including efforts to overcome negative attitudes toward agricultural work, wage and work incentives to meet competing labor demands, vocational and technical training programs, and possibly profit sharing incentives with market expansion.

c. Research and Development

As in other areas (both developed and developing) research and development activities will be basic to overcoming constraints to development and uncovering new sources for growth. The University of Guam's College of Agriculture and Life Sciences (CALS) program is fairly new and seems well positioned to play a lead role in this development. However, given present funding levels, its resources appear to be spread thin. In a number of areas, such as plant pathology, agricultural engineering, animal science, and agricultural economics, the program components are minimal and have just become operational. The second agriculture experiment station is still under development at Ija.

In terms of CALS objectives, a fairly early choice will have to be made between trying to build a comprehensive program in strategic and basic agricultural research or focusing on tactical research to meet island-specific problems. With completion of the second experiment station, the comparative advantage points toward the tactical focus.

In this event, cooperative relationships need to be established with the international agricultural research institutes dealing with tropical problems or the University of Hawaii CTAHR to ensure that relevant projects are being undertaken and findings and limitations promptly transmitted. The Guam role would then be the tactical one of testing for applicability to island conditions and uncovering new problem areas for further investigation. A cooperative endeavor could be established between CALS and CTAHR for a more comprehensive investigation of Pacific island problems generally.

2. TTPI

For the Trust Territory islands, agricultural planning, policy determination, and program implementation have been consistently hampered by the lack or dubious quality of data required for decision making. Production and consumption data are generally inadequate and unreliable, yet essential in determining how much the market supplies and how much is consumed at the subsistence level. This, in turn, would allow assessment of the potential for expansion and the planning of production to avoid gluts and shortages on the market. Other data on the availability and quality of land are also needed to assess physcial limitations on future expansion. Information on the amount and size of land areas available, their exposure to agriculturally unsuitable elements (saline water, storms, etc.) and the economic and social costs of development is also essential, but often outdated or nonexistent.

Thus, a prime consideration for future Trust Territory development is establishment of a comprehensive data system through collection of existing sources considered reliable and initiation of programs to remedy errors or deficiences, overcome informational gaps, and institute new surveys as required.

The preceding sections have highlighted numerous restraints to agriculture development among the various islands, but have also pointed to a number of "pockets" of potential growth. Given the desires voiced by some island leaders for a "new" emphasis in the agricultural sector and appropriate supportive conditions, there is reason to believe that some development will occur.

Probably the most likely place for this occurrence will be the Northern Marianas, although a favorable confluence of land and and water resources in some of the other islands can have progressive results.

The underlying requirement in each case is a firmer commitment on the part of the governments. For the CNMI, present priorities seem to be toward meeting social needs and promoting tourism development. But simultaneous well directed efforts in agricultural development can provide better economic balance in the short run and lessen island dependence on imported foods in the future. The following considerations have been mentioned in previous sections, but bear some repetition in the context of island development:

1. Entrance into the farming sector could be facilitated by making more credit easier to obtain.
2. Farming, as a vocation, should be encouraged through the school curriculum.
3. Production at the farm level could be facilitated by providing more information to the farmers on market supply and demand.
4. Communication of needs and research results between farmers and extension staff should be improved and encouraged.
5. The marketing of produce would be facilitated by the establishment of orderly, formal marketing channels. This would lessen the risk for farmers trying to sell their produce.
6. More stringent controls and better assessment of the implementation of U.S. food aid programs would help alleviate competition due to "free food."

Price support, subsidies and various direct government assistance may be needed initially, but these should not be viewed as permanent nor should the government be seen as the sole supporter of agriculture. Rather, the role of government should be one of a facilitator with the aim of all programs and objectives being the individual farmers. Territorial governments should vigorously pursue the installation of suitably modified USDA and other programs in the islands, which may become more possible under the Omnibus Territorial Act, H.R. 8444.

It appears that the CNMI is establishing strong ties with the University of Guam for its research needs. However, there are areas where Guam may not

be able to provide adequate research facilities. This may be primarily true in cattle production where Guam has very little industry and a corresponding level of interest in these problems. Hawaii's cattle production, on the other hand, may be facing similar problems, making research in this area beneficial to both areas.

3. American Samoa

Again for American Samoa, the past constraints on agricultural development and proposed approaches to revitalization of this sector are not dissimilar from those of the other Pacific islands. For convenience of reference, the major constraints are summarized as follows:

1. The Territory has limited arable land available in large tracts that would be suitable for highly mechanized agricultural production.
2. Over the long term, the government-run agricultural development program may be characterized as erratic, inconsistent, and of minor import among Territorial priorities.
3. An increasing level of expectation in a rapidly changing society has precipitated a negative attitude toward farming--both as an occupation and as an avocation.
4. There are competing and more attractive occupations for American Samoans in government, industry and commerce.
5. Labor intensive agricultural operations, particularly traditional crops for local consumption, cannot compete with current import prices from neighboring Western Samoa or Tonga without subsidies or import restrictions.
6. There has been sufficient breakdown in traditional leadership to deter traditional methods of subsistence farming.
7. There is limited technical expertise among both government extension officials and the farming community.
8. Past programs and projects in agricultural development have been primarily by government, on government experimental farms, which, even if successful, have not involved a potential farming community.
9. Farm credit has been non-existent or very limited. This can be attributed to competitive and more secure requests for limited available capital and to failures in past private sector agricultural projects.

10. Marketing of farm produce has followed historic practices of central distribution through an urban marketplace, but has not had consistent controls or restrictions on "family" imports or unsanctioned imports and distributions.
11. A strong, centrally directed, and relevant research program for agricultural development has been lacking.

In view of these broad constraints, a more selective approach to revival of the agricultural sector in American Samoa is called for. Past efforts have tended to be scattered, without central guidance or substantive support. For example, there have been attempts to develop export industries with macadamia nuts, ginger, flowers, copra, and even taro. At one time or another, virtually every vegetable found in the markets has been viewed as a potential item for import substitution. Although Territorial officials have placed recent emphasis on agricultural expansion in their future development plans, there is no real expectation that American Samoa can or should become self sufficient in food items nor that farm exports will become a significant item in the balance of trade.

What may be feasible, however, is to focus on a few crops and further, to focus this effort among a somewhat select number of commercial farmers or villages where there is adequate land and adequate leadership or incentive. Such an approach would respond to two perceived needs: 1) the need to place the growing of crops on a commercial, profitable basis as an incentive to local farmers, and, 2) the need to focus on a more limited number of crops and produce so that skills, technology, support and supervision can be targeted.

In order to target these efforts, detailed economic feasibility studies of potential commodities--e.g., taro, pork, poultry, bananas--should precede program implementation. The program need not (should not) be limited to import replacement commodities, since some crops have been grown for export from the Territory with some degree of success. Export commodities such as ginger, which are not too land intensive, should be attempted. The growth of ginger may be expanded. Such commodities would not be as subject to the problems incurred in the growth of taro and other traditional food crops and would have a more pronounced commercial image to the potential farming entrepreneur.

Once the commodities are chosen, a program should be mapped out over a three to five year minimum period to determine scope, scale, costs and support requirements. Identified projects should be given extensive publicity in order to encourage maximum response and identify willing, and proficient participants. Such an approach should enable an admittedly limited, but more apt to be successful, group of farmers to realize the business potential of farming and set examples for others to follow. (It should be pointed out that past agricultural development experiments have been, to a great extent, government-run programs, on government-owned land, with limited sharing of technology. The economic benefits, or losses, have accrued to the government).

The absence of large tracts of arable land which are essential to highly mechanized farming, coupled with the scarcity of willing farm labor, may call for agricultural activities that are neither labor or machinery intensive. This suggests some continued attention to subsistence production. While efforts to restore subsistence farming in the past have not been successful, it may be possible to encourage the planting of crops, such as bananas, in family plots adjacent to homes. Bananas do not require the weeding and care that is required of taro. However, even with directed emphasis on subsistence farming, it is highly unlikely that such activity will substantially offset imports.

The introduction or expansion of commercial agriculture would not significantly alter the social fabric of the Territory. While it would enhance the development of entreprenuership, which is not in keeping with more traditional cultural practices, such changes are already in evidence and generally accepted, and it is, therefore, unlikely that such program emphasis would be resisted. The official recognition of such potential activity has already been noted.

The development of agricultural activities, based on private entrepreneurial development, would, in addition to the benefits of local production, help to demonstrate the viability and profitability of commercial agriculture. Such activity, at least initially, would not significantly affect the balance of trade; the Territory would still find it necessary to import a long list of consumer goods. However, it would establish a trend for improved local production, expanded commercial agriculture, and a reduction in the present level of cash outflow.

V. POTENTIAL IMPACTS OF AN AGRICULTURAL DEVELOPMENT PROGRAM

Successful agricultural development on small Pacific islands can have substantial impacts, most but not all of which are beneficial. These impacts are outlined below.

A. Development Period

Agricultural development can generate a very high return on investment. However, the development span, even under accelerated programs, normally covers decades. Quick pay-offs within a few years should not be expected.

B. Economic Impacts

The primary and most visible impacts of accelerated agricultural development are economic, including:

--increased farm employment and income;

--increased rural employment for the construction, operation, and maintenance of irrigation and drainage systems, infrastructure, and related works such as electric systems;

--increased urban (district center) employment for providing supplies and services to farmers (this is usually substantial since farm families normally spend a large portion of their incomes locally);

--higher wages and income for both farm and non-farm families;

--lower food costs;

--improvement in the standard of living;

--improvement in the income distribution;

--an increase in the cash economy;

--increased capital formation as a result of increased savings by farm and non-farm families and businesses; and

--increased tax revenue.

Not all economic impacts will be beneficial, however. For example, the introduction of improved technology and improved productivity can lead to a decline in farm employment when the item is already grown locally and the market will not expand through import substitution or exports. But, even in this case, the income of the farmers who remain should increase, and labor

will be freed for other pursuits. Also, higher--not lower--food costs may occur for those areas where there is a phasing down of the U.S.D.A. food distribution programs.

Family incomes should increase under a successful agricultural development strategy. However, it should not be expected that the incomes of the American-affiliated Pacific islands will increase sufficiently to match those of "developed" countries. The islands generally are insufficiently endowed with resources and other advantages to close the income gap quickly or completely.

C. Social Impacts

Social impacts can be both beneficial and adverse, including:

--increased willingness to attempt further improvements;

--a possible difficult adjustment by some farmers to new practices, a cash economy, credit, etc.;

--relocations and adjustments to new occupations and lifestyles by some, with an increase in personal feelings of frustration and discontent;

--development of rural trade centers which also provide increased services (health, education, entertainment, etc.);

--improved diets and health;

--reduced population growth rates;

--reduced migration to urban centers and reduced out-migration;

--strengthened political power of farmers; and

--an increased sense of hope and tranquility for rural communities.

A major issue for certain island governments may be a decision between (1) preserving social and cultural conditions with little improvement in economic conditions, and (2) pursuing agricultural (and other) economic development which may require setting into motion forces which ultimately may lead to profound alterations, adjustments, and/or weakening of the clan system and communal ownership of land--changes which may be required in order to remove barriers to economic development.

D. Environmental Impacts

If the agricultural activities become substantial, then there is a potential for significant adverse environmental impacts, including:

--disruption of current plant and animal life;

--depletion of soils;

--air pollution--odors from animal concentrations, dust, allergenic pollens, and smoke from burning crop residues, weeds and/or brush; and

--water pollution of streams and lagoons caused by run-off of soils, fertilizers and pesticides.

In those high islands where the streams are used as a source of potable water, cooking, and bathing, water pollution can be a major problem.

E. Planning Implications

It is important in the underlying planning process to consider the diverse and complex nature of any potential economic, social and environmental impacts, which are likely to result from attempts to accelerate agricultural development on Pacific islands. These considerations should influence how planning objectives are stated, the strategies and tactics chosen and implemented, the trade-offs which must be made, and how progress is evaluated. Furthermore, planning for the Pacific islands--just as in other developing areas--must remain flexible, and must be altered occasionally based on the experiences that are accumulated over time.

For the Pacific islands, a more productive agriculture can make substantial contributions to such goals as: improved nutrition, more equal income distribution, increased job opportunities, increased living standards, better economic security, and an improved ecology. To realize any of these goals implies an increase in overall agricultural production. To ensure that such increase contributes to other specified goals requires an effective planning process. An effective planning process in turn includes an adequate set of attainable objectives, an appropriate development strategy, provisions for implementation, and a consistent financial plan or budget. The problems and potentials for developing such a planning process are assessed in the larger report from which this publication was drawn.

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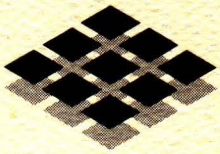

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